Patient Controlled Analgesia and The Assessment and Control of Pain in a Coronary Care Unit

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I certify this thesis the true and accurate version of the thesis approved by the examiners

Signed.[redacted]..... Date.24. Sept. 96

Director of Studies

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"They say it's a beautiful journey from the old world to the new
Some day I'll make that journey to a staircase that leads to you
And when we reach the garden where all are free from pain
We'll put our arms around each other and never part again".

Anon.

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Patient Controlled Analgesia And The Assessment And Control Of Pain In A Coronary Care Unit.

Abstract

Coronary Heart Disease (CHD) is one of the major causes of morbidity and mortality in Scotland. One of the most frequently reported symptoms of CHD is chest pain which is often of sudden onset and severe in nature. The control of pain presents a challenge to nursing and medical staff as patients experience ongoing pain. This study sought to investigate the assessment and treatment of cardiac pain in a coronary care unit (CCU).

Adequate assessment of pain is a fundamental step in its management. Within this study the process of communication with patients who had cardiac pain was assessed by measuring the duration, frequency and content of verbal communication between nurses and patients. Following attendance at an educational programme the staffs' behaviour was reassessed to evaluate any change. No significant difference was observed in the duration or frequency of interaction, but a change was observed in the quality of communication which occurred during pain assessment and the subsequent administration of opiates in CCU.

Having attempted to improve the practice of nursing staff, a comparison of patient controlled analgesia (PCA) versus nurse administered analgesia for pain following myocardial infarction was performed for 48 hours. A significant reduction in pain intensity was reported in the PCA group. The PCA group also used significantly more analgesics particularly in the second 24 hour period. The use of PCA clearly demonstrated the problem of ongoing pain following myocardial infarction. An exploration of the levels of urinary catechoalmine secretion as an objective measure of pain was found to show no relationship to pain experience. The patients' views on the management of their pain and opinions of PCA was also explored. The results suggested that PCA removed the obstacles associated with the administration of analgesia in the conventional regime. It was readily accepted by both patients and staff in CCU and could be easily offered as a treatment option in the management of cardiac pain. This study has generated areas for further investigation which include the influence of alternative education strategies on pain management and the evaluation of PCA with other client groups, and in different clinical settings.

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Chapter 1

General Introduction

1.0 Introduction

Pain is a symptom which is frequently experienced by patients within a hospital environment and may be related to a variety of conditions. The understanding of pain depends on an appreciation of the mechanisms which contribute to the sensation of pain and of factors which can influence the management of pain within the clinical setting either in a positive or negative manner. Within the literature over the last 30 years numerous authors have reported the problems in a variety of clinical settings with the control of pain (Bonica, 1987; Marks and Sacher., 1973, McCaffery and Beebe, 1989; Thompson et al., 1994a; Watt-Watson, 1987). There has been a wealth of literature available which highlights the incidence of pain that patients experience and a large number of people who recognise that the control of pain is far from optimal. Such experience has led to the development of working groups established to produce guidelines to produce good practice (International Association For the Study of Pain (IASP) 1979, The Royal College of Anaesthetists and Surgeons of England, 1990). The Joint Report of The Royal College of Anaesthetists and Surgeons of England (1990) clearly identified the deficits which existed in postoperative pain management and made recommendations to improve pain control. In many areas this has resulted in the development of multi-disciplinary pain teams. The situation now recognised in acute post operative pain is not unique, yet in many other specialities where acute pain is a problem it has not received the same recognition.

For several years the author has nursed patients who are critically ill and most recently has been involved in the care of cardiac patients. Since ischaemic heart disease (IHD) is one of the most common conditions in Scotland, this has resulted in repeated exposure to patients admitted to hospital with cardiac disorders. The commonest symptom associated with heart disease is severe chest pain which is often the primary reason patients seek medical assistance. For a condition of such magnitude it would be expected an expanse of literature would be available. This was not however found to be the case and only limited literature was available relating to incidence and management of cardiac pain. The work in this thesis therefore attempts to make a contribution to this deficit by considering some of the problems associated with cardiac pain. In particular this research will concentrate on two aspects of a multi-faceted problem; the assessment and treatment of cardiac pain. Before discussing the specific aims of this research in greater detail it is necessary to consider the aspects of the phenomenon of pain which will form the background to this thesis. This will include the extent of this problem and the physiological, theoretical and psychological aspects of pain with particular reference to cardiac disease. It is also important to consider each of the steps in the treatment of pain beginning with the fundamental activity of pain assessment. This is an essential prerequisite for the appropriate management of pain yet it is an area which is fraught with difficulties. Adequate assessment of pain is dependant on good communication between nurses and patients. Since this process could undoubtedly influence pain management and there was a paucity of information related to nurse patient

communication with respect to pain in a Coronary Care Unit (CCU), this topic was deemed worthy of further investigation.

Since little information was available related to cardiac pain it was therefore necessary to consider possible treatment options and developments in other fields of pain management and to evaluate their potential benefit in this client group. The move within the current climate is to deliver research based patient focused care. There has also been an attempt to involve the patient as a participant in his care (Myers, 1993). With respect to pain control this has been emphasised by the introduction of new techniques of drug delivery, for example patient controlled analgesia (PCA) which allow the patient to exercise control over his pain management. The complexity of pain is emphasised by the number of factors which can have an influence on this experience and any investigation into the management and control of pain should consider these contributing factors. Each will represent a sizeable body of literature in its own right. It is therefore beyond the scope of this thesis to provide a complete review, however each area considered relevant to the present thesis will be discussed in the following chapter.

1.1 Coronary Heart Disease ; Definition and Incidence

Coronary heart disease (CHD) describes the effects of impaired or absent blood supply to the myocardium (ischaemia) which in most cases is caused by atheromatous obstruction of the coronary arteries (Davies, 1987). Both epidemiological and clinical studies have linked the presence of atheroma to coronary heart disease. Coronary angiography has demonstrated atherosclerotic changes in over 97% of patients with acute Myocardial Infarction (MI) (Pichard et al., 1983). Despite the fact that atheroma is responsible for almost all cases of CHD, there is no direct association as the prevalence of atheroma is greater than the number of people who display symptomatic CHD. There is also often a poor correlation between the severity of coronary artery stenosis and symptoms. Up to 10% of patients with MI and/or angina, especially those in a younger age group, demonstrate no abnormalities in their coronary arteries. In these instances it has been suggested that the problem is precipitated by transient factors interfering with coronary artery blood flow occurring against a background of differing degrees of coronary artery atherosclerosis (Maseri, 1982). The commonest cause of ischaemia in people with normal coronary arteries is severe ventricular hypertrophy to the extent that the myocardium has outgrown its blood supply. Conditions where this is likely to occur include aortic stenosis, severe hypertension and hypertrophic cardiomyopathy.

Myocardial ischaemia results from a discrepancy between oxygen supply and demand. Oxygen supply is dependent on coronary artery blood flow which may be affected by

abnormalities of the vessel wall, systemic blood flow or the blood itself. The former may relate to the presence of fixed or reversible lesions within the vascular system. Fixed lesions are often related to atheromatous plaques although occasionally congenital ectasia may be responsible. Reversible stenosis due to coronary artery spasm may cause intermittent disruption to blood flow which is the underlying mechanism in variant angina as described by Prinzmetal and others (1959). In reality both fixed and reversible lesions are often present in ischaemic heart disease with a varying contribution to impairing flow at different times (Maseri, 1982). Within clinical practice it is now accepted that coronary artery spasm can lead to angina and even MI despite little or no evidence of atheroma at angiography. The most likely explanation is for spasm and fixed stenosis to act in combination creating vascular contraction around a fixed obstruction which causes a critical reduction in flow resulting in regional ischaemia. When the vessel lumen is reduced in diameter by 50% or more this usually results in angina whereas sudden occlusion and obstruction to flow in the coronary arteries will result in tissue necrosis and myocardial infarction. Blood flow to the coronary arteries may also be restricted as a result of aortic valve disease which causes an obstruction to blood flow from the left ventricle and reduces coronary artery perfusion. Abnormalities in the blood itself which cause a reduction in oxygen delivery occur when the oxygen carrying capacity of the blood is reduced in anaemia, or blood viscosity is increased in diseases such as polycythaemia and myeloma.

Oxygen demand may be increased by several factors; increased heart rate, increased force of myocardial contractility and myocardial wall tension. As heart rate increases there is a reduction in the time of diastole within the cardiac cycle. Since coronary artery filling occurs during diastole this results in a reduction in coronary artery perfusion despite a rate related increase in oxygen demand. Any increase in the force of contractility will also increase oxygen demand. Myocardial wall tension is affected by intracardiac pressures and volumes and any increase in tension results in an increased myocardial workload with an increased requirement for oxygen. It is therefore possible to appreciate the influence which factors either increasing oxygen demand or reducing oxygen supply may have in causing myocardial ischaemia in patients with coronary heart disease.

CHD has been cited as the major cause of death in the western world, causing over 163,000 deaths annually in England and Wales (Jowett and Thompson., 1989). Within the population aged under 70, 30% of male deaths and 22% of female deaths are associated with coronary heart disease. There are also widespread problems associated with morbidity as 115,000 patients were discharged from hospital in England and Wales suffering from coronary heart disease (Mann and Marmott., 1987). It has also been identified as the leading cause of death in American adults, contributing to one quarter of all deaths in people over 35 years of age. Despite the reported decline of 49% in age corrected death rate for CHD in the USA, it still continues to be the most serious threat to life and health.

One in three men and one in 10 women will suffer from coronary heart disease before the age of 60 and the incidence and severity increases with age in both men and women. The increase amongst women is more precipitous following the menopause. It is a major cause of death beginning in men from approximately 40 years of age onwards and women from the age of 65 after which time the risks for both men and women are similar. Within the USA it is estimated 20 million people have heart disease and approximately one third will be limited by their condition. Recent reports (Graves, 1989; Delozier et al., 1989) estimated 39 million days were spent in short stay hospitals and 56 million visits made to physicians offices as a result of coronary heart disease. The prevalence of this condition causes 800,000 new myocardial infarctions each year and 450,000 recurrent myocardial infarctions in the USA. It has been estimated the costs associated with CHD in Scotland are over £570 million per annum, of which £140 million is in direct NHS costs. These figures express the magnitude of this problem in today's society but may only represent the tip of the iceberg and it has been suggested there are vast numbers of patients with unrecognised CHD (SODH, 1996). It is not uncommon for unrecognised myocardial infarction (MI) to occur. This may account for one in 4 myocardial infarctions, half of which are 'silent' (i.e. associated with no pain) with the remainder due to atypical presentation, and which are only recognised when the patient develops overt signs of congestive heart failure. The incidence of unrecognised MI appears to be greater in diabetic patients, in particular men, and hypertensive patients of both sexes.

Despite the high prevalence, there has been a reduction in the incidence of mortality attributed to coronary heart disease within the USA which has coincided with improvement in the recognition and reduction of major risk factors, more vigorous and effective treatment of the acute episode and concentration on secondary prevention strategies. The same reduction remains to be seen amongst the UK population. Scotland still has the highest recorded death rate associated with CHD in the western world. Approximately 17,000 people die each year and over half of these people are under 75 (SODH, 1996). Recent reports demonstrated the death rates for men aged 35-74 are 625 per 100,000 in Scotland (Coronary Prevention Group, 1992) and epidemiological studies have revealed large differences even within the UK. Scotland has the highest rate of death from CHD for both men and women and the Southwest of England has the lowest incidence with rates approximately 50% lower than in Scotland (Elford et al., 1989).

1.2 Pain Associated With Cardiac Disease

The recognition of cardiac pain or discomfort as it is more commonly described has been suggested to be the single most powerful tool available for the diagnosis of coronary heart disease (Hammermeister, 1990). The earliest references to chest pain caused by disease of the heart were made in the writings attributed to Hippocrates where specific reference is made to '*palpitation and piercing sensation felt in the breast and pain in the vertebral column*' caused by '*fluxions or humours in the heart*'. This and a variety of other references were made to chest pain. However credit for the first documented description of angina pectoris is given to William Heberden 1768 when he presented his lecture entitled 'Some account of a disorder of the breast' to the Royal College of Physicians in London (Heberden, 1772). His description was clear and concise containing many of the important diagnostic cues still utilised in practice today:

"There is a disorder of the breast marked with strong and peculiar symptoms considerable for the kind of danger belonging to it and not extremely rare which deserves to be mentioned at more length. The seat of it a sense of strangling and anxiety with which it is attended may make it not improperly to be called angina pectoris.

Those who are afflicted by it are seized while they are walking (more specially if it be up a hill and soon after eating) with a painful and disagreeable sensation in the breast which seems as if it would extinguish life if it were to increase or continue but the moment they stand still this uneasiness vanishes. In all other respects the patients are at the beginning of this disorder, perfectly well, and in particular have no shortness of breath, from which it is totally different. The pain is sometimes situated in the upper part, sometimes in the middle, sometimes at the bottom of the os sterni, and more often inclined to the left than to the right side. It likewise very frequently extends from the breast to the middle of the left arm. The pulse is, at least sometimes, not disturbed by this pain, as I have had opportunities of observing by feeling the pulse during the paroxysm. Males are most liable to that disease , especially such as have past their fiftieth year.

After it has continued a year or more, it will not cease so instantaneously upon standing still; and it will come on not only when the persons are walking , but when they are lying down, especially if they lie on their left side, and oblige them to rise up out of their beds. In some inveterate cases, it has been brought on by the motion of a horse, or a carriage, and even by swallowing, coughing, going to stool , or speaking or any disturbance of mind.

Such is the most usual appearance of the disease; but some varieties may be met with. Some have been seized while they were standing still or sitting; also upon first waking out of sleep; and the pain sometimes reaches to the right arm as well as to the left and even down to the hands, but this is uncommon; in a very few instances the arm has at the same time been numbed and swelled. In one or two persons the pain has lasted some hours ,or even days; but this has happened when the complaint has been long-standing, and thoroughly rooted in the constitution; once only the very first attack continued the whole night." (*Cited by Hammermeister in The Management of Pain. Bonica, 1990).*

Heberden not only used the term angina to signify the sense of choking and strangling but also to indicate the extreme anxiety and distress experienced by the patient at this time. It was not, however, well known that Heberden did not associate the syndrome he described

so well as originating in the heart (Hammermeister 1990). Wall (1785) is said to have reported the first natural study of angina pectoris by observing 10 of 13 patients who died suddenly. He attributed their sudden death to disorders of the heart. The observation by Edward Jenner in 1786 of severe calcification of the coronary arteries whilst performing a necropsy on a patient with angina (which he subsequently observed in other patients) convinced him that coronary artery disease was the cause of angina pectoris since he recognised

"*.... the importance of the coronary arteries and how much the heart must suffer from their not being able duly to perform their functions..... it is possible that all the symptoms may arise from this one circumstance* "

(Baron, (1838) cited in Bonica 1990).

In the early 19th Century writers including Home, Warren and Desportes proposed that cardiac spasm was the cause of angina pectoris. The rationale for this assumption was that in some cases of angina no narrowing of the coronary arteries was seen, whereas in other cases of severe coronary disease, identified during autopsy, no evidence of angina had been noted. These historical reports have been confirmed by repetition of their observations during autopsy and invasive investigations carried out in vivo (Bonica, 1990).

In addition to the successful recognition of cardiac pain it is also important to differentiate cardiac pain from other causes of chest pain, in particular aortic dissection, since correct diagnosis is essential to the initiation of life saving treatment. Without the appropriate intervention, 90% of untreated patients with aortic dissection will die within one year, and for 75% of these people this will occur within one month. In the group receiving treatment the survival rates after one year are however 70% (Anagnostopoulos et al., 1972; Wheat, 1980).

The historical description of cardiac pain reveals this is not a new phenomenon and has been present in society for hundreds of years. Over this time observation and investigation have contributed to an increased understanding of anatomical factors which may potentially contribute to the development of cardiac pain. The extensive increase in the incidence and prevalence of CHD has resulted in an increased number of hospital admissions. Patients admitted with acute MI account for approximately 50% of all admissions to hospital with CHD. This resulted in over 22,000 admissions in Scotland during 1992. This provides evidence of the increased the number of patients seen suffering from severe chest pain. The majority of these patients admitted with a suspected MI will be admitted to the Coronary Care Unit to allow intensive medical and nursing intervention.

Before going on to examine the management of pain in CCU in more detail as will be done in sections 1.6 and 1.7 and chapters 3 and 4, it is necessary first to discuss the nature of

pain and its influencing factors and secondly to review the extent of the problem with regard to cardiac pain.

1.3 Definitions of Pain

In addition to extensive efforts by scientists and health care professionals alike to understand and control pain, many individuals have also tried to define pain. The difficulty this task creates was demonstrated by the words of Lewis (1942) who stated "*I am so far from being able satisfactorily to define pain.... that the attempt would serve no useful purpose*". Later workers however, persisted with the attempt to provide a working definition and Sternbach (1968) subsequently described pain as "*a complex phenomenon, a signal of tissue damage, threat integrated defence reaction and a private experience of hurt*". More recently the International Association for the Study of Pain (IASP, 1979) defined pain as "*an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage*". This definition has been promoted by the IASP and it was hoped would become universally accepted. The aetiology, mechanisms, pathophysiology, symptoms, approach to diagnosis and subsequent management of acute and chronic pain differ. Acute pain was described as " *a complex constellation of unpleasant sensory, perceptual and emotional experiences and certain associated autonomic, psychological emotional and behavioural responses*" (Bonica, 1990). Acute pain is usually short lasting as a result of effective therapy and/or the self limiting nature of the disease or injury. It usually disappears within days or weeks. In contrast, chronic pain which is defined as *'pain that persists a month or more beyond the usual course of an acute disease or the usual time for an injury to heal or that which is associated with a chronic pathologic process that causes continuous pain or the pain recurs at regular intervals for months or years*'. In its chronic persistent form, pain probably has no biological function, but may be a damaging force that often imposes severe emotional, physical, economic and social stresses on the patient and their family. The most important practical definition for nurses caring for patients in pain is 'pain is what the patient says it is and exists when he says it does' (McCaffery 1983). The work presented in this thesis will concentrate on acute pain as this is the primary problem encountered by staff in the care of patients following myocardial infarction. In the following section it is intended to describe the theories which underpin the present knowledge of pain mechanisms and contribute to current understanding of the phenomenon, which may in turn direct treatment in the clinical setting.

1.4 Theories of Pain

Various theories of pain have been developed over the centuries. Each has attempted to explain the mechanisms involved and has contributed to our understanding of pain. Within the following section there is a brief review of these theories for completeness however the main focus of the discussion will concentrate on the pathophysiology of cardiac pain. The development of physiology as an experimental science during the 19th Century led to the study of sensation in general and pain in particular. Experiments in animals, determined that the function of the dorsal roots was sensory and the ventral roots motor (Bell et al., 1827; Magendie, 1822). The impetus to the continuing study of pain was enhanced by the writings of Muller (1840) who proposed the "Doctrine of specific nerve energies" which suggested that the brain received information about external objects and body structures by way of sensory nerves (Wheat, 1980). The sensory nerves carried a particular form of energy specific for each of the five senses; sight, smell, hearing, taste and touch. It was proposed the sense of touch included the sensation of pain.

The specificity theory proposed by Descartes in 1664 (as described in Bonica 1990, Latham 1991) has influenced the beliefs of many scholars involved in the study of pain. This theory suggested following stimulation of specific pain receptors in the skin, messages were then relayed to a pain centre in the brain. A later search for the pain pathway in the spinal cord was carried out by Keele (1957). Studies suggested that the anterolateral quadrant of the spinal cord was critically important for pain sensation. As a consequence the spinothalamic tract (STT) which ascends in the anterolateral cord has become known as the pain pathway. The specific location of the pain centre is still a source of debate but it is thought that this may lie in the thalamus and that the cortex can exert inhibitory control over it. The specificity theory suggested that the receptor in the skin would always elicit pain and only pain. The psychological evidence however weakens this theory of a one to one relationship between pain perception and the intensity of the stimulus and suggests that the amount and quality of perceived pain are determined by many psychological variables.

The next group of theories which arose are classified under the general heading of the pattern theory. In contrast to the specificity theory it was proposed that the patterns of impulses which produce pain are produced by summation of the impulses of the skin and sensory input at the dorsal horn cells and not by specific pain receptors. The supporters of this theory proposed that persistent pain was due to abnormally long periods of summation. In 1934 Nafe suggested all cutaneous qualities were produced by spatial and temporal patterns of nerve impulses rather than by specific transmission routes. The peripheral pattern theory (Sinclair, 1955) proposed that all nerve endings are alike and pain is a result of intense stimulation of non specific receptors. Pain results when the total output of these cells exceeds a critical level due to excessive stimulation of non specific receptors which are normally activated by non noxious stimuli.

The theory of pain proposed by Hardy, Woolfe and Goodell (1952) reintroduced the concept of the duality of pain i.e. the perception of pain and the organisms reaction to it. Both the perception and reaction to pain may be influenced by past experiences, culture and various psychological factors.

Whilst these theories all made contributions to the understanding of pain none addressed all the factors which can influence the perception and response to pain. In an attempt to overcome the deficits in the pervious explanations, the Gate Control theory was developed by Melzack and Wall (1965). This attempted to integrate the physiological, motivational and cognitive processes associated with pain.

The Gate Control theory suggests that pain impulses are transmitted to the T cells in the dorsal horn of the spinal cord. At this point impulses may be modulated by a spinal gating system. The spinal gating system may either inhibit or facilitate the transmission of impulses. Inhibition of the impulses is influenced by the relative amount of activity in large diameter fibres. In contrast, facilitation of impulse transmission is influenced by the relative amount of activity in small diameter fibres. The spinal mechanism is also affected by impulses which descend from the brain. A specialised system of rapidly conducting large diameter fibres known as the 'central control trigger' activate the central cognitive processes which send impulses via the descending tracts to modulate the spinal gating mechanism. When the output of the spinal cord T cells exceeds a critical level, it activates the action system which produces the complex pattern of behaviour and experience characteristic of pain.

Melzack and Casey (1968) expanded this theory to include the activity of the neospinothalamic centre in the brain which processes information related to the location, intensity and duration of the stimulus. In addition, the activation of the reticular activating system and the limbic system provides the powerful motivational drive associated with pain and the unpleasant effects which trigger the organism into action. This theory was further modified in 1982 to account for the descending inhibitory control originating from the brain stem systems.

Research has continued since the 1960's but the principles of the Gate Control theory are still widely accepted, as it attempts to demonstrate the complexity of pain with three main components; sensory-discriminational, motivational-directive and cognitive-evaluative aspects of pain. It can help explain the differences in pain experiences between individuals in many settings.

More recent work has also studied the contribution of endogenous opioids or endorphins to the modulation of pain. Opioid binding sites have been identified in differing

concentrations at a variety of sites in the body. The highest concentration of receptors being found in the limbic system, thalamus, hypothalamus, mid-brain and the spinal cord (Atweh et al., 1983). These receptors are responsive to endogenous opioids and drugs. The concept of opioid stimulated descending inhibitory control of pain arose from micro injection studies which identified that the area of the brain adjacent to the 3rd and 4th ventricles was highly sensitive to opioids and injection of small doses resulted in effective analgesia (Jurna, 1980). The injection of naloxone, the opioid antagonist, into the periaqueductal grey matter would reverse this opioid induced analgesia. Further support of these effects was given by the work which demonstrated that stimulation of the raphe magnus in animals potentiated the effects of morphine. In contrast lesions of this area reduced the effectiveness of morphine (Alexander et al., 1988). Micro electrode recordings performed in dorsal horn neurones demonstrated the ability of systemic opioids to block the response to noxious stimulation. At the same time the responses of these neurones to non noxious stimuli were relatively unaffected (Duggan, 1979).

The most recent interest has related to the concept of neuroplasticity (changes in central nervous system) and its contribution to pathological pain. Peripheral tissue damage or neural injury often leads to pain, hyperalgesia (an increased response to noxious stimuli) and allodynia (a reduction in pain threshold). This pain may persist for years after all possible tissue healing has occurred. Despite the fact that peripheral neural mechanisms (e.g. nociceptor sensitisation and neuroma formation) may contribute to these processes, recent evidence suggests that the changes in central nervous system function may also play a significant role. In addition to these effects it is also possible following peripheral tissue or nerve injury to demonstrate an increase in the duration of response to brief stimulation, and a spread of pain and hyperalgesia to uninjured tissue as observed in referred pain and secondary hyperalgesia. A detailed review of the clinical and experimental evidence which indicates the contribution of central neuroplasticity to pathological pain was published by Coderre et al (1993). This addressed the physiological, biochemical, cellular and molecular alterations in the central nervous system (CNS) as a response to noxious peripheral stimulation. This evidence suggested that the noxious stimuli may sensitise the central nervous structures which are related to the perception of pain. The most powerful examples of this were the experiences of patients who suffered phantom limb pain identical to the experience of pain they had prior to amputation of the limb. The effects of pre-emptive analgesia and its benefit postoperatively were also considered. The evidence of the changes in the CNS were illustrated by the development of sensitisation, wind up or expansion of receptive fields of the CNS neurones as well as the persistence of pain and hyperalgesia after inputs from the injured tissue were blocked. The perception of pain can be seen to be affected by processes which are constantly changing and are influenced by the effects of past experiences. New sensory stimuli act upon nervous systems which have been modified by previous inputs and behavioural responses are significantly affected by the memory of these prior events. In contrast to previous theories of central sensitisation

recent theories propose the influence of specific cellular and molecular changes which affect membrane excitability and induce new gene expression thus allowing enhanced responses to further stimulation which is additional to the contribution of neuronal hyperactivity.

The development of these theories and an increased understanding of the mechanisms involved has the potential to influence pain management in the future. It is possible that this may coincide with the development of selective receptor antagonists in the treatment of pain. At present the suggestion is that this will be of most significance in the management of postoperative pain, and may also have a role in severe chronic pain. Until further work is undertaken it is important to act on our current understanding of the mechanisms of pain and to intervene with the most appropriate treatment to provide effective pain management. In determining how best to do this in the treatment of cardiac pain the nature and specific characteristics of cardiac pain will now be discussed.

1.5 The Nature and Characteristics of Cardiac Pain

In order to provide effective management it is helpful to understand the nature and mechanisms involved in cardiac pain. The excellent review presented by Hammermeister (1990) has influenced the format and discussion of the following section. The pain associated with coronary heart disease, angina and myocardial infarction has a common denominator - ischaemia. The pain is visceral in nature therefore is typically vague, diffuse, poorly localised and often referred to other areas of the body. People often find it difficult to describe and use terms like discomfort, tightness and constriction rather than pain. It may also be associated with parasthesia, numbness and weakness in the upper limbs. Not uncommonly it is misinterpreted as gastric pain. This is due to its epigastric distribution and characteristic feeling of being like 'heartburn' accompanied by the intense desire to belch. The pain associated with myocardial infarction often displays all the characteristics of ischaemic pain but it is often more severe and of longer duration than anginal pain. It is never like plueritic pain i.e. worse on movement and it does not vary with position as pericarditic pain will do. Its visceral nature allows differentiation from chest wall pain or pain originating from superficial structures. It may occur anywhere between the diaphragm and the mandible but typically it occurs in the anterior chest, retrosternally radiating to one or both arms, throat or jaw. Occasionally it may be confined to the throat, jaw, arms and epigastrum. Indirect evidence has suggested that the area of referred visceral pain may be influenced to a significant degree by the extent and size of myocardial ischaemia and necrosis. The more ischaemia the greater the nociceptive barrage, and transmission of impulses into the spinal cord and brainstem; and consequently the greater the spread and intensity of the pain. As well as pain, the patient may develop hyperalgesia in the spinal segments involved.

The damage to the myocardial tissue can act as a physiological stressor and may subsequently initiate the stress response to injury. In addition to the physical stress resulting from the tissue damage, the patient may also be subject to the psychological stress which may be associated with pain. These stressors can precipitate both physiological and psychological manifestations (Hyland and Donalsdon 1989). The former are often involuntary responses which include altered activity of the autonomic nervous system, release of catecholamines, and alterations of blood flow to the muscles. These responses prepare the individual to activate the 'fight or flight response'. The experience of pain can independently act as a stressor and may exacerbate the physiological manifestations. Pain may also have psychological effects which include the stimulation of a strong alarm reaction and feeling of impending death. Associated symptoms of nausea, vomiting and profuse sweating are common. After several hours, patients often feel that the pain is more precisely located in the chest wall or upper limbs. This was described by Teodori and Galleti (1962) as the second phase of myocardial infarction. They had observed complaints

of muscle tenderness in the pectoralis major, the deep muscles of the inter scapular region, the forearm and less often the trapezius muscle.

It has been known for some time that ischaemic myocardial pain can act as a trigger for secondary musculoskeletal pain, located in the anterior or posterior chest wall, as a result of spasm of these muscles. This secondary pain may become the predominant pain syndrome which may be perpetuated by chronic anxiety. This allows explanation of the features of pain which may last for a few days at rest, is associated with no electrocardiographic (ECG) changes and is unresponsive to antianginal therapy. This persistent pain was explained by Bonica (1953) and Rinzler and Travell (1948) in the following manner. In addition to the initial cardiac visceral pain, a visceromotor reflex produces spasm in the skeletal muscles of the reference zone which produces localised areas of tenderness in the chest muscle called trigger points. This secondary muscle spasm acts as an independent source of noxious stimuli which produces pain and more muscle spasm therefore a cycle of impulses has been established without further dependence on afferent impulses from the heart. These impulses are transmitted to and from the somatic structures by the closed self exciting chains of the internuncial neurones in the central nervous system. This response is shown overleaf in Figure 1.1. It is possible to break the circuit by blocking the somatic component; thus relieving the patient's pain.

Progress over the past 30 years and the development of sophisticated electrophysiological techniques has supplemented our knowledge of anatomy, provided new understanding of the functions of sympathetic and vagal afferent fibres and their roles in activating homeostatic reflex mechanisms. The contribution of the two stressors of tissue injury and pain previously described, may contribute to the pathophysiological state caused by cardiac disease which will now be discussed.

Agostini et al (1975) showed the extensive innervation of the heart by A-delta and C fibres from the vagus nerves. Others have shown many of these nerves are stimulated by bradykinin, ischaemia and a variety of mechanical stimuli (Thoren, 1979; Kaufmann, 1946). These nerves are not involved in nociception as transection of the vagi has no effect on responses to noxious stimuli (Brown, 1967). A body of clinical and laboratory evidence supports the transmission of nociceptive impulses principally by the sympathetic afferent fibres which are also involved in the reflexes controlling cardiovascular homeostasis (Mandl, 1925; White, 1957). These fibres may transmit the information which results in tightness in the throat or a strangling sensation thus playing a role in the modulation of cardiac pain.

Within the cardiac sympathetic nerves there are almost equal numbers of myelinated A-delta fibres and unmyelinated C fibres both of which are activated when cardiovascular haemodynamics are normal. Experimentation in neurophysiology has demonstrated that

during coronary artery occlusion the activity of the A-delta and C fibres increases significantly. The response of the A-delta fibres is often slow (mean 80 seconds), is dependant on myocardial stretching and has spontaneous active discharge which occurs in synchrony with cardiac rhythm. The sympathetic afferent activity increases when the pressure inside the heart increases. The responses of the C fibres, in contrast, are quicker (10-20 seconds); firing in an irregular manner unrelated to the cardiac rhythm or mechanical factors.

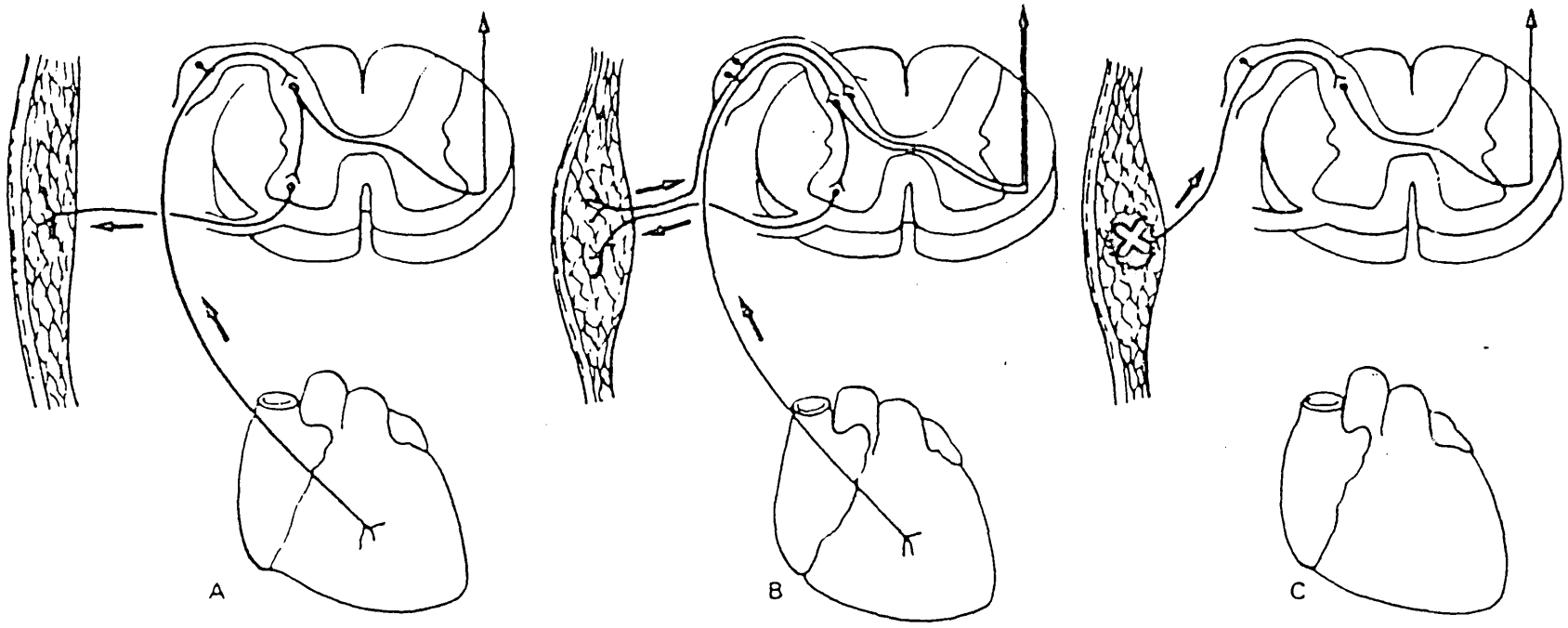


Figure1.1

A Nociceptive impulses from the ischaemic myocardium to the dorsal horn causes efferent stimulation of the muscles in the chest wall resulting in muscle spasm.

B Muscle spasm itself creates a source of noxious stimulation that produces trigger areas

C After the input from the ischaemic myocardium has ceasesd, the nociceptive input from the muscle continues.

It has been suggested that cardiac pain results from sensitisation and activation of the sympathetic afferents by the release of algogenic agents from the ischaemic myocardial muscle. Chemical mediators (serotonin, histamine, bradykinin and acids) markedly increase the activity of C and some A-delta fibres and the effect of bradykinin is augmented by prostaglandins. These characteristics observed by many workers have led to the proposal that most A-delta and a few C fibres are mechanoreceptive in function and are concerned with the circulatory regulation, whilst most C and a few A-delta fibres are nociceptors (Malliani, 1982; Coleridge et al., 1980; Ueda et al., 1969; Lombardi, 1981).

Brown and Mallani (1971) had been among the investigators initially suggesting the existence of specific nociceptors. However their work was carried out in animals with a transected spinal cord and low blood pressure, suggesting the haemodynamics may have been below the threshold for the activation of some of the mechanosensitive endings. This prompted further animal studies the results of which caused them to dispute the existence of these specific receptors (Malliani, 1982; Malliani et al., 1984). Their work casts doubt on the validity of the specificity theory in relation to cardiac pain and has resulted in a modification of the intensive theory being used as a working hypothesis for cardiac pain. i.e. the pain can result from the extreme excitation of a spatially restricted population of afferent sympathetic fibres. As Mallani (1982) said

"an intense excitation of afferent sympathetic fibres would be more likely to reach the effectiveness of a nociceptive code when characterised by spatial heterogeneity. Thus beside the extension and severity of the ischaemia which could determine the background of the afferent excitation, further crucial stimulation of the sensory endings could occur in those regions where mechanical stretching is maximal or where an abnormal vasomotion takes place."

Conversely when sympathetic afferent activation is widely distributed, some central modulation can prevent pain perception.

Myocardial ischaemia can produce visceral pain. The mechanisms of true visceral pain have not yet been precisely defined although they are probably the result of nociceptive impulses passing into the upper thoracic spinal chord, where activation of the spinothalamic tract (STT) as well as neurones of other ascending systems occurs. STT neurones which respond to visceral input but not to cutaneous input have not been found. Experimental evidence suggests that this is the mechanism of true visceral pain (Nishi, 1977). Studies have also been done to examine the mechanisms of referred pain and they demonstrated that the STT received convergent information from A-delta and C nociceptors in the skin, underlying muscles and the heart. The receptive fields of the cutaneous and muscle afferents are located in the ipsilateral upper anterior and lateral chest and in the medial and upper aspects of the ipsilateral forelimb. This work supports the

'projection convergence theory ' of Ruch explaining why cardiac pain is felt in the anterior chest and arms.

As has been previously suggested pain experiences are extremely variable. The mechanisms responsible for this include the activation of inhibitory mechanisms which will now be discussed. The ability to inhibit 61% of the spontaneous activity of the STT in the T1-T5 segments and 100% of the STT cells which responded to noxious somatic excitation by stimulation of the left thoracic vagus nerve was demonstrated by Ammos et al (1983). Stimulation of the cardiac vagal nerve could also produce a similar response and could inhibit the STT response to an intracardiac injection of bradykinin. The effects of vagal stimulation have completely disappeared after the transection of the spinal cord in the cervical region. This work suggests that the activation of the descending pathways by vagal stimulation is strong enough to depress cell activity even when the cell has received noxious input. All the STT cells in the upper thoracic segments that respond to an intracardiac injection of bradykinin with an increase in activity can be inhibited by stimulation of the nucleus raphe magnus (NRM). It was postulated the afferent vagal impulses that reach the nucleus of the tractus solitrius activate efferent fibres which project to the medial reticular formation and the hypothalamus, which in turn causes stimulation of the NRM. This mechanism has been speculated to be responsible for the silent MI or painless myocardial ischaemia. Thus under proper conditions ischaemia can occur without pain because vagal output into the brainstem powerfully activates the descending inhibitory pathways which in turn reduce the responsive responsiveness of the STT to the sympathetic afferents.

The pain associated with an acute MI warns the person of danger stimulating a limitation of activity and prompting them to seek help. Once it has served its purpose it should be relieved quickly as persistent pain is associated with reflex responses which can aggravate pathophysiology and have widespread effects. The necrotic tissue damage produces local biochemical changes, stimulates vagal and sympathetic afferents to produce pain and activates segmental and supra segmental reflex responses. The chemical mediation of the sympathetic afferent fibres may be increased by the physiological motion of ischaemic myocardium. Activation of the vagal afferents can provoke abnormal reflexes involving afferent and efferent fibres of the cardiac vagi and sympathetic nerves. This results in symptoms of vagovagal and sympathosympathetic reflexes. In normal circumstances the two extrinsic controls of cardiac function have reciprocal neural organisation therefore stimulation of the sympathetic fibres will cause inhibition of the vagal fibres and vice versa. During an acute MI these mechanisms are disturbed, often both systems are overactive. The relative dominance of the sympathetic or vagal nerves is influenced by many factors which include the presence and the intensity of pain, as well as the size and location of the infarct. In an anterior MI the sympathetic system is predominant and in an inferior MI the vagal nerves are stimulated. The danger of untreated pain is highlighted by

the vasovagal effects of the Bezold-Jarisch reflex causing a profound bradycardia, atrio-ventricular block, peripheral vasodilatation and hypotension. Concurrent sympathetic hyperactivity will increase the strength of myocardial contractility, which is an important mechanism to prevent the development of ventricular dilatation and cardiogenic shock. To the patient's detriment however increased sympathetic activity will increase the demand for oxygen consumption on the myocardium.

Animal experimentation has shown that alpha-adrenergic stimulation of the sympathetic nervous system may cause vasoconstriction of the coronary vessels reducing blood flow and oxygen supply (Fiegl, 1967; Fiegl, 1975). There is limited evidence available in humans, but increases in vasoconstrictor tone can be augmented to the point of angina in patients with coronary artery disease (Mudge, 1976). It has also been shown by laboratory and clinical evidence that sympathetic hyperactivity can contribute to the pathophysiology of myocardial infarction (Mueller, 1974) and fatal cardiac arrhythmias (Kliks et al., 1975).

The mechanisms of pain following myocardial infarction have been discussed in the previous section. In summary, the effective control of pain is important to prevent the deleterious effects initiated by segmental and supra segmental responses. These include an increase in the workload of the heart and its oxygen consumption as well as increased clotting and blood viscosity which in conjunction with vasoconstriction will reduce blood flow and further increase the discrepancy between oxygen supply and demand. The consequent exacerbation of ischaemia and expansion of the infarction may have fatal consequences therefore it is vital to relieve pain, reduce anxiety and psychological distress to minimise or eliminate these abnormal responses promptly and effectively. Since the continuation of pain may have detrimental effects for the patient the following section will review the reported incidence of cardiac pain and discuss the treatments offered.

1.6 Incidence and Treatment of Cardiac Pain

Chest pain is the principle symptom leading to the hospitalisation of patients with MI. The assessment and management of cardiac pain have been a concern of many nursing and medical staff within the clinical area over the past two decades, but there is evidence to suggest that the management of chest pain is still not optimal. The administration of narcotic agents, commonly diamorphine or morphine, remain the treatment of choice in the management of acute MI. Narcotics are rapidly absorbed into the CNS, and consequently induce a state of euphoria and altered perception of pain which may also reduce the anxiety associated with MI. The peripheral pooling of blood can also reduce the cardiac workload. Despite these potential benefits the treatment of pain with narcotics is often inadequate (McCaffery and Hart, 1976).

A landmark study highlighted the under treatment of pain in medical in-patients with narcotic analgesics (Marks and Sacher., 1973). Within their patient population, 19% of the subjects had a diagnosis of myocardial infarction and 3% had angina. This work reported that 32% of the patients who had received narcotic agents were still suffering severe distress, and another 41% were in moderate distress, demonstrating a failure to treat patients with adequate amounts of analgesia. Exploration of the possible causes revealed that many of the physicians underestimated the effective dose ranges, overestimated the duration of drug action and exaggerated the dangers of addiction for patients receiving drug doses within the therapeutic range. More recent studies have also shown that the management of cardiac pain has not greatly improved. Bondestram et al (1987) observed pain assessment by patients and nurses in the early phase of acute MI and demonstrated underestimation of pain still occurred in 23% of occasions and overestimation in 20% of the occasions. The relationship between the patients' assessments of pain and the frequency of morphine administration by nurses within 15 minutes of pain scoring was studied. The researchers found that the number of times morphine was administered increased with increasing pain scores, but still no pain relief was administered in a high proportion of patients with scores >5 on a numerical rating scale (NRS). This occurred in approximately 50% of the patients who scored their pain at 5-6 and 20 % of those who scored their pain at 7-8. The patients who did receive analgesia received varying doses of morphine (5-15 mg). Reassessment within 30 minutes of the administration of analgesia in 37% of the cases showed that there was no reduction in pain scores or that the pain reduced by one point on the NRS. Many patients in this study were not completely free of pain within the first 24 hours in coronary care. The patients seemed to accept a pain score of 1-3 on the NRS which may be a reflection of their expectations of pain relief. The absence of treatment and effect in patients whose pain levels were reported as 7-8 was alarming but it has been suggested that this supports the suggestion of other workers that nurses do not assess pain correctly (McCaffery and Beebe, 1989; Pilowski et al., 1969). Bondestram et al (1987) postulated that the reasons for ineffective treatment even when the patients had fairly severe pain could be the belief of staff that narcotic agents should only be given for severe pain, or that the nurse may wait until the patient requests analgesia or reports significant pain upon questioning. It has also been suggested that nurses who work for extensive periods of time with patients in acute pain may become less sensitive to complaints of pain (Lenburg et al., 1970; Mueller, 1974). This work suggests room for improvement in pain assessment in acute MI. In addition it demonstrated that the immediate pain relieving effects of morphine left much to be desired, especially when doses of 5 mg were used. It is likely that these doses were inadequate and that the traditional treatment of pain in MI needs to be re-evaluated with regard to the method of drug administration, the dose used and the choice of drug.

A study by Hofgren et al (1988) showed similar inadequacies in pain management within the first 24 hours of MI. Hofgren reported a continuous decline in pain levels scored using

NRS but it was found that some degree of pain often remained. The mean pain scores were measured in this study and at no time in the first 24 hours did this reach zero. After 20 hours the mean pain score was 2 for the group identified as having smaller infarcts based on CK elevation, and 2.5 for the group defined as having had a larger infarct. The latter group reported higher mean scores than the former group throughout their stay in CCU and demonstrated a twofold increase in morphine requirement within the first three hours of their stay in CCU. Basford (1990) also demonstrated that patients with larger MI required more opiates in the first three hours of admission to CCU.

Another study described the under-management of pain in CCU with inadequate administration of diamorphine (Townsend, 1988). Townsend looked at the administration of analgesics prior to admission and found 30 out of 48 patients had received no pain relief before transfer to hospital. Similar reports have been made of the inadequacy of pre-hospital pain relief. A review of 160 patients admitted to CCU with acute MI revealed 65% received no opiates before admission (Wyllie and Dunn, 1994). Of the patients who did receive opiates 14% received this via the intramuscular (IM) route which is not recommended for a variety of reasons. Firstly the absorption and effect of IM injections are slower and less predictable especially if the patient is peripherally shut down, as the blood flow will be diverted from the skin and peripheral muscles to the central organs. This impaired blood flow to the IM injection site results in a slow uptake from the tissue. An intramuscular injection can also raise the serum creatinine kinase (CK) level which may affect the diagnosis of myocardial infarction. In addition, since thrombolytic therapy is administered to the majority of patients on admission, intramuscular injections place them at risk of haematoma formation. A study carried out in Sweden (Fridlund and Carlsson., 1992) looked at the management of chest pain by ambulance personnel in transit to the hospital. Eighty two patients had been admitted during the period of the study, 75% of whom had suffered chest pain, and of those 91% received pain relieving drugs. The drugs which were administered however were oxygen in 82%, entonox in 18% and morphine in only 6%. In all the patients who were given morphine total relief was experienced, some improvement was experienced in 52% of those receiving oxygen, and 55% of those receiving entonox. The administration of morphine provided the best treatment but this could only be administered by certain trained ambulance personnel which meant this was not an option for all patients. The authors suggested consideration should be given to the implications of educating and training paramedical staff to allow more effective pain management pre-admission as some of these journeys can take up to one hour. Even within urban areas there is often inadequate pain relief. A recent report in a Glasgow Hospital also reinforced the lack of analgesia administered by General practitioners in the community prior to admission to hospital (Wyllie and Dunn 1994).

The pre hospital provision of analgesia is less than adequate however reports of the provision of drugs following admission to hospital also suggest pain management is suboptimal. Townsend (1988) reported 29% of the patients admitted to CCU were given 2.5 mg diamorphine, with only 6% achieving relief of pain. 12% required a further 2.5 mg, and 10% required a further 5 mg before achieving relief. Of the patients who initially received 5 mg diamorphine (54% of those admitted), 61% gained immediate relief, 19% needed a further 2.5 mg, 12% required a further 5 mg and the remaining 8 % required a further 7.5-10 mg diamorphine before complete relief was obtained. This suggested that IV diamorphine 5 mg was more effective than the lower dose in most people but individual variation meant a small proportion of patients required higher doses of opiates for adequate relief of pain.

A later study also concentrated on the effectiveness of pain assessment and analgesic administration in CCU during the first 24 hours (Willetts, 1989). Less than half the patients received adequate pain relief within 30 minutes of drug administration which had been given either IV or IM. Eighty percent of a third sample of patients said that their pain never really disappeared throughout their stay in CCU. Over half the patients said they were in hospital for longer than 24 hours before they were totally painfree (the longest time being up to 4 days). Despite not being free of pain patients still said that they would only report pain when it reached an intolerable level. The immediate pain relieving effects of diamorphine were not impressive. Both staff and patients questioned whether the continuous administration of low dose narcotics over the first 24 hours would benefit the patient. Despite this being a study with a small sample size it also revealed inadequate pain management. A criticism which could be made of this and other studies was the length of time before the assessment was made to determine whether the patient was pain free after drug administration. It is advocated the best route for drug administration is intravenous (IV). Administration of an IV drug will have it's peak effect within minutes therefore this would be a more appropriate time interval for reassessment of pain as it would allow the administration of further narcotics if required. Since the pain course following MI is difficult to predict, it is difficult to assess whether or not relief or complete disappearance of the pain has been a result of drug treatment.

Each of the previous studies discussed have shown cardiac pain is often inadequately relieved. Despite narcotic agents being the drugs of choice, even after morphine administration delays of up to 30 minutes after IV injection and up to 90 minutes after IM injection have been reported before relief is obtained. The analgesic effects of diamorphine are thought to be quicker as it is more soluble in water, rapidly converted to 6-monoacetyl - morphine which passes quickly through the blood brain barrier. The duration of analgesia is also difficult to estimate due to the variable time course of MI. There is little information available on the optimal doses of narcotic agents in MI although in other clinical situations 7-9 mg morphine /70kg has been reported as optimal. Further increases in dose did not

provide better pain relief. A study by Beecher and Lasagna (1954) of postoperative patients found that 15mg provided effective pain relief in 83% of patients and 10mg provided relief in 74% of patients.

Since this review has suggested that opiate administration may not provide optimal pain relief the effects of other drug therapies which have previously been used for the management of cardiac pain will be given in the following section. This will consider whether they could offer improved pain relief for cardiac patients.

1.7 The Role of Non Opioid Agents in the Relief of Cardiac Pain.

Despite the widespread use of narcotic agents in the management of cardiac pain there are a variety of different pharmacological agents which it is suggested may be of benefit in the management of pain. There are various reports in the literature which describe the benefits of the administration of intravenous beta blockers. Rapid relief of pain often within a few minutes has been demonstrated. Studies of intravenous beta blockers (metoprolol) in the acute phases of MI supplemented by oral therapy in comparison to placebo demonstrated a shorter duration of pain and less administration of analgesic agents (Waagstein et al., 1975). Further examination of a subgroup analysis in this study showed less pronounced effects in those with lower initial heart rates and blood pressure, as well as patients with inferior as opposed to anterior MI. These results support the theories that patients with a higher initial sympathetic tone and without a raised parasympathetic tone will have more substantial pain relief after beta blockade (Kaiser, 1992). These explanations relate to the effects of cardiac pain on the segmental and supra segmental reflexes discussed previously (section 1.5) and the likelihood in anterior MI of activation of the sympathetic system. Similar studies have been reported with other beta blocking agents such as timolol (The International Collaborative Study Group, 1984) which demonstrated significant reductions in pain scores in the treatment group. Within the larger of these studies, the Gotenburg Metoprolol Study of 1395 patients, the requirements for analgesics was reduced by 30% in the treatment group (Richterova et al., 1984). Similar effects although on a smaller scale, were reported by Ramsdale et al.(1982). In this study, of the patients who had received intravenous atenolol followed by oral drugs, only 60% required analgesics within the next 2 hours as opposed to 77 % in the placebo group. This report however provided no information as to whether patients had received opiates prior to the administration of beta blockers. It is possible the dose and duration of previous opiate administration could have influenced the patients subsequent opiate requirements.

In the MIAMI (Metoprolol In Acute Myocardial Infarction Trial) the duration of pain was reduced by 17% for the patients in the treatment group and the number of patients who reported severe chest pain was reduced by 42% in this group (MIAMI Trial Research Group, 1985). These results supported the work of Waagstein and Hjalmarson (1975).

Once more the effects demonstrated were greater in sub groups with a higher initial heart rates and blood pressure. In those with low BP and heart rate, the pain course and analgesic use was similar in those given treatment and placebo.

There are several possible mechanisms which have been suggested to explain the pain relief shown following beta blockade. No direct analgesic effect has been shown, but limitation of infarct size may result in pain relief as could the reduction in the heart rate and blood pressure with a consequent reduction in afterload (resistance against which the heart has to pump). Reduced myocardial oxygen consumption due to a reduction in contractility may also contribute to reduction in pain levels as all these factors will improve the balance between coronary blood supply and demand. The reduction in the metabolic demand of the myocardium may allow redistribution of blood flow to ischaemic areas. The reduction in heart rate also allows an increase in diastolic filling of the coronary arteries. Studies performed in animals demonstrated an increase in the collateral circulation to ischaemic myocardium with the administration of metoprolol and propranolol (Buck et al., 1981, Watner et al., 1977). All the potential effects discussed may be related to the hypothesis that pain relief results from a reduction in ischaemia, which is supported by the reduced rate pressure product and reduction in ST elevation seen in association with pain relief (Jackson et al., 1975, Richterova et al., 1984). Opiates on the other hand reduce pain without any effect on ST segment elevation in acute MI. Despite these observations, the use of intravenous blockade is not commonplace in coronary care units despite the fact that approximately 80 % of the admissions could be given beta blockers in the acute phase. If IV administration in the acute phase is to be considered in the management of pain associated with MI the staff must be aware many patients admitted to CCU may already take beta blockers as part of antianginal and or antihypertensive therapy. Patients admitted on long term treatment may require higher doses than previously untreated patients due to the up regulation of the beta receptors.

The use of glyceryl trinitrate (GTN) within the early phase of MI has been accepted as providing pain relief but the evidence for this is inconclusive (Yusuf et al., 1988). Those who received IV GTN did have initial pain relief but their long term requirement for analgesia was not reduced (Mikolich et al., 1980). This contrasts with the reports of effective pain relief and reduced requirement for opiates in angina (Kaplan et al., 1983; Mikolich et al., 1980). The use of nitroprusside has also been reported. The benefits seen in mortality reduction and in infarct size are unfortunately not demonstrated in the intensity or duration of pain (Yusuf et al., 1988).

The use of thrombolytic agents has been reported to restore blood flow to the myocardium but until recently little had been reported on its effects on chest pain and analgesic requirements in acute MI. The results of the TEAHAT study (1991) reported an impressive 43% reduction in mean total score of pain, a 26% reduction in the pain duration

and a 33% reduction in the requirement for morphine in the group treated with recombinant tissue plasminogen activator (rt-PA) (Risenfors et al., 1991). This study was carried out on 312 patients. It should be noted these patients also received IV beta blockers if they had no contraindications to treatment. The analgesic given was morphine 5-10 mg IV which could be repeated within 15 minutes if ineffective. Persistent pain required re evaluation of the administration of beta blockers, addition of a sedative and if pain still continued IV GTN was given. Patients had equivalent mean pain scores before treatment but for the subsequent 24 hours the pain score of the patients was less in the rt-PA group. The introduction of a variety of therapies which could all have an effect on pain experiences makes the interpretation of these results less clear. The mean duration of pain after admission to CCU however was 11 hours 34 minutes in the placebo group and 8 hours 19 minutes in the treatment group. This study also had a subset of patients who did not have confirmed myocardial infarction who still demonstrated a considerable reduction in pain in the group who received rt-PA. The effects of the other commonly used thrombolytic agent, streptokinase, on chest pain in acute MI was reported in a retrospective study (Christensen et al., 1991). This compared 76 patients who were treated with streptokinase to 76 patients who were not treated. All patients had confirmed MI and less than 6 hours of symptoms before entry. This study observed the duration of pain and the requirement of analgesics. The analgesic used in this study was nicomorphine 5mg IV and 5mg sub-cutaneously on each request. The control group required twice as much nicomorphine as the treatment group (41 mg versus 20 mg - median values). The median duration of pain was 3.5 hours in the streptokinase group and 24 hours amongst the controls. What was however noted to be a significant difference was the infarct size as estimated by lactate dehydrogenase (LD), thus the infarct size was estimated to be larger in the control group. This is a factor which has previously been reported as influencing opiate requirements (Anderson et al., 1984, Hofgren et al 1988). This study revealed a significant reduction in the need for nicomorphine in patients treated with streptokinase who had an LDH level < than 1500U/l. The duration of pain was significantly reduced in patients who had LDH levels < 1500 U/l. In the groups with smaller infarcts the tendency was for a shorter duration of pain in the streptokinase group. Other reports have shown a positive correlation between complete resolution of cardiac pain in acute MI and reperfusion of the coronary arteries (Califf et al., 1988; Kircher et al., 1987). It can be suggested therefore that although the evidence is limited the administration of thrombolytic agents can reduce the duration and intensity of pain following MI.

There have been reports of other treatment strategies in managing the pain of an acute MI. These include the use of sedative agents which suggested a reduction in mortality after one month and one year in patients who received levomeperazine in comparison to those given pethidine (Davidsen et al., 1979). Anti inflammatory drugs have also been used and one study reported improved pain relief with IV indoprofen, 400mg as compared to intramuscular morphine 10 mg. It must be acknowledged that the routes of administration

were different in the two groups and this could have influenced the outcomes. A comparison of buprenorphine and diamorphine for chest pain post MI showed no difference in the two treatments in terms of pain relief or duration of action (Hayes et al., 1979).

The use of inhalation agents have also been reported. Nitric oxide for pain relief in MI was shown to achieve complete relief of pain in 39% of patients. The effect was most impressive in those with mild chest pain (Thompson and Lown, 1976). In the UK, a study of the use of entonox in comparison to air was reported in 88 patients with myocardial infarction which was given in a coronary care unit (Kerr et al., 1975). This was given as the primary analgesic or as second line treatment when the standard analgesia had failed to improve pain within thirty minutes. It demonstrated an improvement in pain relief in those with severe pain but not in those reporting moderate or slight pain or when administration continued after 10 minutes. It was suggested that the greatest relief was experienced in those who experienced severe pain as they had an increased motivation to use the apparatus efficiently. The effects are not prolonged as nitrous oxide is rapidly excreted following discontinuation of therapy therefore it may only be possible to achieve the desired result by continuous administration of the gas by face mask. Its benefits therefore may only be apparent in the short term such as transport to hospital.

The therapies considered so far have all been given using conventional methods of drug administration either IM, IV or via inhalation. Despite the shortfalls previously reported in the treatment of cardiac pain with opioids it appears this still remains the best treatment and one which is accepted in clinical practice. It is possible therefore the problems may not lie with the drug itself but with the route of administration. Advances in clinical skills and the development of new techniques for the administration of drugs have occurred in recent years. The following section will review other routes of drug administration which have already been reported in cardiac patients.

1.8 Optional Routes of Drug Administration for the Control of Cardiac Pain

Since advances in drug therapy have failed to produce new drugs which have the analgesic properties of the opioids but without their side effects, research has moved on to explore different routes of drug administration which will be briefly reviewed in the next few paragraphs.

The delivery of drugs via the intrathecal or epidural routes is common practice in many intensive care settings often for the management of postoperative pain or pain associated with trauma (Houde, 1982; Topf, 1969). The successful application of these techniques in

clinical practice stimulated interest in the potential for their application following myocardial infarction.

Intrathecal morphine was used in a small study of 19 patients, who were divided into two groups either receiving intrathecal morphine or IM/IV morphine or pentazocine (Pasqualucci et al., 1981). The results showed a greater efficacy in 24 hours of a single intrathecal dose of 0.5mg morphine with respect to a repeated analgesic dose administered either IV or IM. There was no evidence of circulatory or respiratory side effects. The only detrimental side effect reported was a tendency towards urine retention.

Epidural administration of analgesia was first reported by Skoeld et al (1985) who studied 6 patients who had previously been given up to 15mg morphine or other opioids or both without effect for cardiac pain. After injection of 1.2 -2.4 mg of morphine into the epidural space, 5 patients were free of pain within 30 minutes and the remaining patient required a further injection of 1.2mg. Two required only the initial dose, the other 4 required 1-3 injections of 1-2mg with an interval of 4 to 12 hours. These preliminary results suggested the value of lumbar epidural morphine for the relief of pain in patients with MI in whom conventional analgesics have failed. A subsequent report demonstrated that continuous thoracic epidural analgesia provided effective pain relief with the administration of bupivicaine 0.25% for myocardial pain which was unrelieved by standard therapy (Toft and Jorgensen, 1987). There were only 14 subjects who fulfilled the entry criteria over a 15 month period from a total of 376 patients admitted. The catheter was inserted into the epidural space at the T5-T6 level and following a test dose of 3 mls of 0.25% bupivicaine the catheter was connected to a continuous epidural infusion which was increased until adequate analgesia was obtained within a maximum dose of 8 ml per hour. The results showed that 86% of the patients were painfree within 30 minutes of epidural infusion and the remaining two patients achieved some but not complete relief. The mean duration of use was 29.5 hours with a mean dose of 6.1 mls per hour (range of 5-8 mls/hr). During the infusion period 5 patients had received a phenothiazine and small doses of morphine parenterally for sedation. Although their use was primarily for sedation their potential pain relieving effect could not be ignored. The authors recommended that the use of this technique should be restricted to patients who are cardiovascularly stable, with respiratory insufficiency and or emesis due to opioid analgesics (Gaston-Johnansson et al., 1991).

An alternative strategy which has only been reported in acute MI in one previous study is the use of Patient Controlled Analgesia (Eltringham et al., 1983). It is the use of this technique which will be evaluated in this thesis and therefore this will be discussed in more depth later on.

It can be concluded from the reports which have previously been discussed in the last two sections that pain is often inadequately managed following myocardial infarction. The

evidence suggests even when narcotic agents are administered patients continue to suffer from unrelieved pain (Bondestram et al 1987, Hofgren et al 1988, Townsend 1988, Willets 1989). The effectiveness of other drug therapies for example beta blockers have shown some benefits in pain reduction, yet this is a technique rarely used in clinical practice (Richterova et al., 1984, Waagstein et al., 1975;). Conflicting evidence was presented for the effect of nitrates (Kaplan et al., 1983, Mikolich et al., 1980;). The use of inhalation agents also had varied effects and it was unlikely would ever replace opiate administration (Kerr et al., 1975; Thompson and Lown 1976). The limited literature available related to intrathecal and epidural administration of opiates in MI meant any conclusions drawn about the effectiveness of pain management using these methods should be tentative. They are techniques which are worthy of consideration in cases of pain unrelieved by conventional therapy. They should only be introduced however in an environment where adequate expertise and monitoring is available for the management of epidural and intrathecal lines. Thrombolytic therapy appears to have the potential to reduce the duration and intensity of pain post MI (Christensen et al., 1991, Risenfors et al., 1991) and since this is now recognised by medical and nursing staff to be an essential part of the management of myocardial infarction it is likely to have the greatest effect on pain experience.

This section sought to review the various drug therapies which have been used in the treatment of cardiac pain. In conclusion it appears narcotic agents will remain the drugs of choice in the management of pain associated with MI. In the future improved pain management may therefore concentrate on new delivery systems of these agents. The previous discussion has helped to identify current deficits in care and to highlight the area of interest to the present thesis which is the use of patient controlled analgesia in the management of pain associated with myocardial infarction. This will be discussed in more detail in chapter 4.

The evidence presented suggested that the relief of pain following MI could be improved. It was necessary to establish whether a problem existed in CCU, Ninewells Hospital, Dundee. Clinical experience and the reports in the literature have suggested the problem of inadequate pain control is not always recognised. One reason for this may be that patients do not report their pain to the staff. This results in what has been described as 'hidden pain' (Schneider, 1987). Although the literature is limited in this area Schneider (1987) reported a small study conducted in the USA (n=19). This study revealed 80% of women and 71 % of men did not report all episodes of chest pain during their admission in a coronary care unit. Similar findings were reported by Mackintosh (1994) in a study of 55 patients who were admitted to CCU. Of the 80% of patients who experienced pain 19% delayed in reporting chest pain for more than 20 minutes and 4% failed to report it at all. Fourteen percent failed to report chest heaviness and 40% failed to report neck and jaw ache which are also features of cardiac pain. This has implications for clinical practice as effective pain management will only be possible if the problem of non reporting of pain has been

identified and recognised. This will only be achieved if pain is adequately assessed by the nursing staff. Pain assessment is the fundamental step in the process of pain management and this will now be discussed in the following section (1.9).

1.9 The Assessment and Measurement of Pain

Kodiath (1986) stated 'the key to effective pain management is accurate assessment' yet pain assessment has frequently been described as inconsistent despite a body of information on how to improve pain management (Balfour, 1989; Camp, 1988; Davis, 1988). It has been suggested that staff are often not thorough in their pain assessment (Akyrou, 1995, Dalton, 1989, O'Conner 1995) and often they do not use pain assessment tools to assist with a systematic evaluation of the patients pain (McNaull et al., 1992). In addition, the routine use of the measurement of the effectiveness of analgesic therapy is rare (Mitchell and Smith., 1989).

There are a variety of factors which may contribute to the inadequacy of pain assessment which have been highlighted in the literature (Scott 1992). This may be categorised into three broad areas which include; poor communication by patients of their pain levels to the staff and equally poor communication by the staff , lack of recognition of the patients pain experience, and finally the role of the nursing staff in pain management. Each of these categories will be discussed in turn.

1.9.1. Poor Communication of Pain by Patients

Nursing staff have been criticised for failing to recognise pain in patients. Pain however is a subjective experience and it may be very difficult for nurses to determine the presence of pain when patients are unwilling to report their pain and communicate with the nursing staff.

1.9.2 Influences on Pain Experience and Expression

The expression of pain and pain related behaviours vary extensively between individuals, which adds to the difficulty of assessing and measuring this subjective experience. The perception of pain is the point at which the individual recognises a stimulus as painful but since there is no direct and invariant relationship between any particular stimulus and the perception of pain, comparable stimuli in different people produce different intensity and duration of pain. The variations in pain intensity and duration observed in people with similar painful medical conditions may be partly explained by the theories previously discussed in section 1.4. In addition the effects of high levels of naturally circulating endorphins can suppress the intensity of the pain experience.

As well as the pain modulating effects which may occur in the CNS, a variety of extrinsic factors may play a role in the personal expression of pain. The factors which influence the individuals behaviour can also affect the judgements people make about the extent of

another persons pain and suffering. It is a common belief amongst health care workers that the pain experienced following chloesystectomy, laminectomy or thyroid lobectomy will be moderate to severe for 1-2 days and subside or be completely resolved over 3-4 days. It was reported by Melzack et al (1987) in a study of 88 patients, that 31% of them had pain which persisted beyond the fourth day which resulted in patients receiving inadequate analgesia.

It was suggested that any health care professional who is experienced in the care of patients with a particular condition will be able to develop some fairly accurate conclusions about the range of intensity and duration of pain the person with that condition is likely to experience (McCaffery and Beebe, 1989). This was supported by Thompson et al., (1994) who reported that staff showed a high correlation in scoring the intensity of pain in cardiac patients. It was suggested that the ability of staff to score the intensity of pain accurately was related to their extensive experience of nursing cardiac patients in pain. A naturalistic study by Jacovane and Dostal (1992) observed the judgements made by expert compared to novice nurses in relation to the assessment and treatment of cardiac pain. They found the former group utilised past experience, intuitive thought processes and clinical knowledge to guide their decision making. This group of staff would provide a resource to novice nurses to enhance their learning and decision making in exercising clinical judgement to provide higher quality of patient care. This contrasts with previous reports suggesting that staff do not assess pain accurately.

The pain tolerance of an individual is related to the duration and intensity of pain that a person is willing to endure. This is the individual's unique response to pain and there is great variability between patients. Even within an individual their pain tolerance may increase or decrease in different situations which may include habituation, attention and attribution of the cause. It may be possible to tolerate mild pain for a long time but only tolerate intense pain for a short time. The patients pain tolerance may influence their choice to report pain and or to receive analgesia. It is important to accept that patients have the right to choose to feel pain or refuse analgesia however it is important for nursing staff to ensure that the patient arrives at this decision based on accurate information and not as a result of fears and misconceptions (McCaffery and Beebe 1989). In certain cultures a value judgement may be placed on pain tolerance. Often a high pain tolerance is admired with the expectation men can tolerate more pain then woman and adults more than children. The influence of culture on pain experience and expression will now be considered.

1.9.3 Culture and its Effects on Pain

The influence of culture and socialisation on the development of human behaviour have been widely studied. Each culture has a unique set of belief systems which provide individuals with a unique explanatory view of the world which provides a foundation for their understanding of universal human experiences such as health and illness, pain and suffering. Behaviour patterns are learned during the process of socialisation and are reinforced by social interactions within a particular social network. Attitudes to pain are acquired from early childhood and learned from siblings, peers and parents. In certain cultures pain is rewarded by attention, affection and comfort, whereas in others emotional responses to pain are discouraged as stoicism is a valued trait. The work done by Zobrowski (1952) remains one of the classic studies of cross cultural responses to pain in hospital patients. Four groups were studied; Jewish, Italian, Irish and Old American. His findings revealed the Jews and Italians tended to be very sensitive to pain and exaggerated their pain experiences. They talked about their pain freely and readily called for help. Their pain was expressed by moaning, groaning and crying and they preferred relatives to be with them when they were in pain. Despite displaying similar pain reactions they had different underlying attitudes. The Italians focused on the immediacy of the pain and the sensation, readily forgetting their suffering once the pain had passed, whilst the Jews concentrated on the symptomatic meaning of the pain and its significance in terms of future health. The Jews were reluctant to take drugs because they offered only temporary relief rather than long term cure. These variable reactions therefore required different interventions. For Jews the anxieties related to the cause of the pain should be relieved whilst for the Italians it may be more appropriate to relieve the pain itself.

In relation to the Irish and the Old Americans these groups displayed little emotion when they were in pain. They appeared calm, offering no complaints about the severity of their pain not wishing to be a nuisance. The groups did show a difference in their ability to talk about their pain; the old Americans were spontaneous and clear about their pain, the Irish were more vague and had difficulty communicating about their pain. Similar findings were reported by Zola (1983) who compared the Irish and the Italians. These reports provide interesting information about the behaviour patterns of various cultures however it is important not to generalise and to avoid responding to cultural stereotypes. Each person irrespective of race or culture should be treated as an individual and have his pain assessed and appropriately treated to meet his individual requirements.

Variable pain expressions may create misunderstanding during pain assessment. The attitudes of the health care workers can also affect their interpretation of the degree of pain and suffering they think patients are experiencing. This was studied extensively by Davitz and Davitz (1981). The nurses were shown to infer different degrees of pain and suffering for patients with identical illness and/or injury. Their inferences were affected by both the

nurse's and patient's culture. The responses to pain reflected the values and beliefs of the nurse's own backgrounds. Staff inferred less physical and psychological pain amongst the oriental, Anglo-Saxon and German patients than the Jewish or Spaniards. The nurses from Belgium, UK and USA rated patients as having lowest levels of both pain and distress. The reactions of a patient to pain when this did not agree with their personal attitudes was difficult for some staff to deal with.

Davitz and Davitz (1981) emphasised nurses must be aware of their own cultural biases which could affect pain but should avoid inflicting their own cultural values on patients. If nurses continually infer less pain than the patient is suffering then the patient is in danger of being labelled by the staff. The work by Davitz and Pendleton (1969) showed notable differences between the behaviour of American White, American Black, Puerto Rican and Thai nurses, supporting the hypothesis that the inferences of suffering are related to the learned behavioural response of a given culture, with the Puerto Rican nurses being the most sensitive to patient suffering. They also considered whether nurses who worked in a different speciality inferred differing degrees of pain, but they found no difference between the staff in medical-surgical, paediatric, psychiatric and obstetric areas. Consideration of whether the patient's diagnosis prompted differences in inferences of pain and suffering revealed relatively similar ratings across the diagnostic categories. In relation to patients' age, sex and socio-economic status they found that staff inferred more pain in the young than old, and in middle or lower classes than upper classes. No differences were revealed between male and female patients in the middle and lower classes .

The influence of occupation has also been considered in relation to inferences of pain and suffering. The judgements made associated with verbal and non-verbal expression were studied between nurses, doctors and social workers. All three groups inferred greater physical pain for verbal pain expression but did not differ in their inferences of verbal and non-verbal psychological distress (Baer, Davitz and Leib 1970). Non healthcare workers were also reported to infer greater amounts of physical pain and psychological suffering in a study by Lenburg, Glass and Davitz (1970) who found nuns, followed by teachers, then nurses and finally doctors inferred the greatest degree of physical pain and psychological suffering. It was also proposed that the length of time in a programme of nurse education could influence the degrees of suffering inferred (Mason, 1981). This will be discussed in greater detail in section 1.10.

It is evident that the relief of pain is a major concern and when making inferences about a patient's suffering staff rely on both verbal and non-verbal observation of the patient. Jacox and Stewart (1973) had found 65% of the patients in their study tried not to show pain and were reluctant to discuss it with staff. Thiedermannn (1989) explored the reasons for patients not reporting pain to the staff and found some feared addiction to the drugs or wanted to be the 'perfect patient'. In Scott's study (1992) 44% of staff were not aware

patients behaved in this manner and therefore would make the assumption that because the patient did not report pain he was painfree. As suggested by Dudley and Holm (1984) *"nurses are involved in diagnosing human responses; yet, conflicts arise when the response is something such as pain, unknown or ill defined*" therefore "*We must acknowledge that the process involved in making clinical judgements may be incomplete and that in the final analysis, only the patient knows where the pain is and how much it hurts*". The role of health care professionals is to be aware of this problem and to avoid the trap of not recognising the existence of pain.

1.9.4. Lack of Recognition of a Patient's Pain

Despite some advances in the clinical measurement and evaluation of a patient's pain and the large area of research concentrating on the development of tools aimed to enhance the person's verbal expression of pain, staff may often not recognise the fact that a patient is in pain. When staff do acknowledge a patient is in pain they can create problems if they rely on their own judgements and make inferences about pain, as these are often inaccurate (Seers, 1989). Within the research on pain assessment there have been some attempts to determine the attitudes of nursing staff towards pain assessment. The attitude scale used by Davis (1988) was again used by Scott (1992) in her study. In this study Scott distributed questionnaires to both qualified staff and student nurses in their final year of study and had a 65% response rate. The majority of respondents were found to agree with the commonly held views about pain and its assessment. For example in response to the statement " Pain is what the patient says it is and exists when he says it does" only three of all the respondents opposed this. In contrast 38% were unsure or opposed the statement "What the patient says about his pain is always true'. This demonstrated the confusion and contradiction amongst respondents completing the questionnaires. This supported work by Saxey (1986) who reported the frequently nurses do not believe what the patient states about his pain. Saxey (1986) reported 52% of qualified staff did not believe in the patients reports of their own pain. This conflicts with the philosophy behind pain management i.e. pain is what the person says it is. Thirty three percent of the nurses who took part in this study did not believe that the complete relief of pain should be their goal. In another study of 433 nursing staff it was highlighted that the staff may not accept the patient's report of pain (Jacox, 1979). In this study from a list of seven indicators of pain the patient's verbal report was ranked as 5th on that list. A more recent survey in 1990 reported over 50% of the nurses did not know that the patient's self report of pain was the single most reliable indicator of its presence.

There was also confusion amongst staff as to whether the details of pain assessed should be passed on verbally or documented in the patient's records (McCaffery and Ferrell, 1994). Research has concentrated on the development of assessment tools which can help patients

communicate their experiences. The variety of tools available which have been use in the acute pain setting will now be described.

1.9.5 Tools for the Assessment and Measurement of Pain

In the assessment process the nurse gathers information from the patient related to his experience of pain which then guides her in the planning and evaluation of strategies for intervention. Since pain is rarely static the process of assessment needs to be continuous. A variety of methods have been described for the assessment of pain; these range from measurement scales which score the intensity of pain to the use of lengthy and complex clinical interview schedules. The reliability, validity and the most appropriate context for the use of these instruments still causes great debate in their practical application (Chapman et al., 1990). In their simplest form rating scales which describe the intensity of the perceptual experience have been widely used. The best known and most common of these instruments is the Visual Analogue Scale (VAS) developed by Huskisson in 1974 (Figure 1.2).

Figure 1.2 The Visual Analogue Scale

In order to establish if pain has been relieved it necessary to measure it and this measurement should be both accurate and sensitive. The VAS has been described as relatively free from bias and reliable. It allows the presence of an infinite number of points between the two extremes. The criticisms of this instrument however have included the fact it only represents a single dimension of a complex multidimensional experience. It has also been reported to be difficult for some patient groups to understand in particular the elderly (Herr and Mobily 1991). In response to practical experience, modified instruments such as the Numerical Rating Scale (NRS) which is divided by numbers from 0-10 where 0 = no pain and 10 = the worst possible pain (see figure 1.3) have been developed.

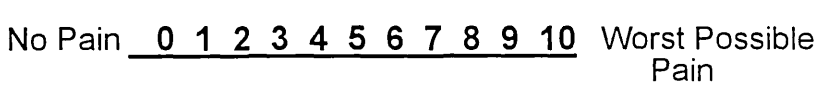


Figure 1.3 The Numerical Rating Scale

The use of a descriptive pain scale is also common in an attempt to measure pain. A four point scale described by Keele (1948) allowed the categorisation of pain into slight, moderate, severe and agonising. The use of this scale by later researchers led to the removal of 'agonising' as this was rare and the replacement of 'slight' with 'mild' (Hewer et al 1949). This scale continued to be used as it had the advantage of simplicity. However its lack sensitivity may impose a restriction on the responses of the patients. The categories

may be very broad and it is also difficult to quantify the relative size of differences between the terms which may result in the assumption being made that the differences are equal. The more recent development of intensity rating scales allow the patient to mark the description that he/she would use to describe the pain.

The use of questionnaires to assess pain is also common. Methods which rely on verbal communication have the potential to be affected by ambiguity or imprecision in expression. The development of questionnaires therefore allows them to be either spoken or read with a fixed format and a sequence of questions. The advantages of such instruments as the McGill Pain Questionnaire (MPQ) are the rapid attainment of information and the prevention of large variations in the administration of successive assessments (Melzack, 1975). This questionnaire may be administered in verbal or written form. Its use is restricted however by the length of time which it can take for completion, often 20 minutes, which in many situations is unacceptable. This has been overcome in certain situations by the use of the short form McGill Questionnaire (Melzack, 1987).

Mechanical pain recorders have also been used in the past whereby the patient presses a button at regular intervals throughout the 24 hour period and are particularly useful in pain research as they allow a 24 hour period of assessment which one person would find difficult to cover. The more firmly the patient presses the button the more intense the pain. A recent report described the use of interactive computer animation to assess pain (Swanston et al., 1993). This system aimed to meet the requirements of an assessment tool i.e. it provided a quantitative measure for analysis and evaluation, captured the differing qualitative dimensions of pain, did not rely on linguistic competence and it had face validity. The initial assessment of this tool in 50 chronic pain patients showed the results obtained using this and the short form of the MPQ correlated significantly in the group of subjects who chose more than one descriptor in the MPQ to describe their pain. The same correlation was not found in the patients who chose only one verbal descriptor for their pain. This study essentially reported the first step in the development of this instrument. Further expansion could allow additional dimensions of the quality of pain to be defined. It could also be assessed within different patient populations and in the field of acute pain.

The methods discussed for the measurement of pain up to now have relied on the subjective rating of pain by patients. This has been described as the most reliable index of pain measurement (Houde, 1982). Patients may however deny the presence of pain as they describe their experience using a different term, for example discomfort. In order to remove their reliance on the verbal reports of patients, staff have in the past sought objective verification of the persons pain experience. They may have looked for the presence of alterations in haemodymanic parameters e.g. heart rate and blood pressure. They may have looked for evidence of grimacing, postural and facial expression (Thomas, 1991). Alternatively they may have relied on objective measurement of biochemical

indices e.g. the concentration of hormones in plasma samples. Unfortunately these measures often tend to be inaccurate and are not easily applicable in clinical practice (Mitchell & Smith 1989). Despite this, attempts have been made in the past to measure objective signs of pain and these will be briefly presented in the following section.

1.9.6 Objective Measurements of Pain

Despite the recommendations that staff should accept the patient's description of pain many researchers have attempted to identify and measure objective indicators of pain. This has included the observation and recording of drug consumption and physiological signs. The commonest have been the recording of heart rate and blood pressure (Flagherty et al., 1978), abdominal muscle tension in post operative pain (Wells et al., 1986), indices of recovery such as a reduction in respiratory infection which have been measured using temperature, chest X-ray and pulmonary function tests (Bollish et al., 1985, Lange 1988, Cushieri et al 1985, Nayman 1979). A specific scale was developed to assess the number of pulmonary complications which could arise due to the presence of continuing pain (Boyle et al., 1977). The measures included the presence of pyrexia (>37.5°C) for more than 48 hours, new or increased cough, new or increased sputum production, positive bacteriological culture of the sputum and the prescription of antibiotic therapy. One point was scored by the presence of each of these items. The advantage of this scale was it did not involve subjective judgements by the researcher. The use of peak expiratory flow rate has also been reported (Thompson, 1989). These measures were all reported in studies of post-operative pain. The objective measure utilised in this research study was to be the measurement of urinary catecholamines as an indirect indicator of pain. The specific technique will be described in more detail in chapter 2 and later in chapter 4.

Catecholamine secretion has been reported to increase in situations of unrelieved pain (Bonica, 1987). In the case of myocardial infarction the increase in catecholamine secretion has been reported in both animal and human studies. The increase in adrenaline levels in dogs is detectable within minutes of coronary ligation (Stanszewska-Barczak, 1971). Numerous studies have been reported reporting the elevation of plasma catecholamines in man within the first 24-48 hours after the onset of pain in acute MI (Siggers et al., 1971; Nadeau et al., 1971; Karlsberg et al., 1981). In early MI plasma noradrenaline and adrenaline concentrations are enhanced reflecting an increased activity of the whole sympathetic nervous system. In uncomplicated MI the levels may show a five fold increase, but since this is no greater than may be seen in healthy individuals during moderate physical exercise it is not likely this level of elevation would play a significant part in the deterioration of myocardial function during ischaemia. Of greater importance is the increase in catecholamine secretion related to pain, anxiety or a fall in cardiac output or arterial blood pressure which is accompanied by the local exocytotic release of noradrenaline from the sympathetic nerve endings of the heart. The arrhythmogenic effects of the increased catecholamine levels are well documented (Videback et al., 1972). Catecholamine levels have in the past been shown to be related to the amount of damaged myocardium and the haemodynamic consequences of MI. Experimental work has also shown good correlation between the size of necrotic tissue and catecholamine secretion. Schomig et al, (1984) reported relationships between plasma concentrations of adrenaline

and noradrenaline and angiographically determined reduction of ejection fraction of the left ventricle. Reperfusion of the myocardium within 3 hours of MI was associated with a return in plasma catecholamines to near normal despite impaired haemodynamic performance of the heart. It was thought this may be due to reduced activity of cardiosystemic reflexes directly activated by the presence of localised ischaemia due to myocardial under perfusion (Schomig et al 1984). The release of catecholamines in myocardial ischaemia has been categorised into three phases. The first occurs within 10 minutes of ischaemia, where release is dependant on the activity of cardiac efferent nerves. The extra cellular accumulation of noradrenaline is limited by the activity of the neuronal uptake process. The sympathetic neural uptake is inhibited by the presynaptic effects of adenosine. The progressive failure of the sympathetic neurotransmission occurs due to energy depletion of the cells. The second phase within 10-40 minutes of ischaemia is characterised by a massive accumulation of catecholamines in the extracellular space of the myocardium, primarily noradrenaline but also adrenaline and dopamine to a lesser extent. The third phase which occurs after 40 minutes of ischaemia involves the progressive depletion of noradrenaline in the sympathetic nerves. The release occurs in parallel with the development of structural membrane defects and can no longer be blocked by inhibitors of neuronal uptake. These phases described have been determined by the study in the isolated heart and it is likely that more complex interactive mechanisms will occur in vivo.

The sympathetic nervous system in man is continually active however variation in the degree of activity occurs with time and from organ to organ to maintain homeostasis. The secretion of adrenaline and noradrenaline increases in times of stress and the measurements of the catecholamine content of plasma and urine have been extensively used as indices of sympatho-adrenal activity. Only a small proportion of the total production of noradrenaline, adrenaline and dopamine are detectable in the urine in the free unconjugated form. The free noradrenaline and dopamine arises from intra and extra renal sources whereas the adrenaline fraction arises purely from extra renal production. The metabolism of these catecholamines is complex and the urinary free fraction is a product by the glomerular filtration of non protein bound catecholamines from plasma, overspill from intrarenal nerves, tubular synthesis and tubular excretion (Bartlett 1992).

Urinary catecholamines are used as an index of sympatho-adrenal system (SAS) activity as they are a direct product of the system under investigation and are available for quantification in plasma and urine samples. This indicates the activity of the SAS at a particular time. Alterations in the plasma catecholamine concentration may provide a good source of information related to SAS activity in relation to an acute event but it gives no indication as to how active the system was in the previous two hours. The urinary catecholamines on the other hand will provide an integrated measure of overall activity over the period of interest and they are less sensitive to transient changes in SAS activity. The measurement of noradrenaline and adrenaline are used as indices of SAS activity since

both compounds will reflect glomerular filtration of plasma catecholamines originating from the SAS.

There have been reports in the literature of correlation between the increases in the levels of catecholamines and physiological effects e.g. Siggers et al., (1971) showed a correlation between noradrenaline levels, increased systolic blood pressure, pulmonary oedema and transfer to the general ward. In contrast, increased adrenaline levels only related to pulmonary oedema and the incidence of ventricular ectopic activity. This suggested that there was an increase in catecholamine secretion associated with emotional arousal and it could be important to sedate and relax patients. Early studies of catecholamine measurements have been viewed with caution as the techniques of measurement of catechoalmine levels pre 1970 were not as effective as the current ones. The reports in the literature however did suggest increased catechoalmine secretion was related to arrhythmias, heart failure and cardiogenic shock. One study was reported which specifically considered the relationship of plasma catechoalmine release in uncomplicated MI as an indicator of pain. This study by Husebye et al (1990) involved 22 subjects who had central chest pain within the previous 24 hours. The pain experienced had lasted more than 20 minutes. Plasma samples were taken off between 10.00 and 14.00 hours daily. Immediately prior to sampling they were asked to rate their pain on a 3 point scale of No Pain, Slight Pain or Moderate to Severe Pain which were scored as 0,1 and 2 respectively. The findings revealed uncomplicated MI was associated with increased sympathetic nervous activity during the first 24 hours and plasma adrenaline was related to pain rather than to MI. The significant increase in plasma levels was only detected in arterial sampling (Husebye et al., 1990). Peripheral removal of adrenaline has been suggested to be the likeliest cause of this effect. The authors have suggested that the increases in catecholamines observed may be due to the complications associated with MI rather than the MI itself. This study also highlighted the variation in the production of catecholamines amongst patients but the highest levels are seen in the first 24 hours. All patients who had slight pain were found to have elevated plasma adrenaline levels, no relationship was detected between infarct size and catecholamine secretion. A relationship between higher plasma catecholamine levels and greater myocardial damage has previously been reported (Karlsberg et al, 1981). It was suggested the relationship may actually have been related to the presence of cardiac failure in patients with large MI rather than the MI itself.

On the basis of these reports the author decided it was feasible to perform catecholamine measurements on patients following myocardial infarction. Urinary profiles were chosen as being more representative of the patient's condition over time. This method would avoid the influences of sudden actions which might have resulted in a surge in catecholamine levels immediately prior to sampling. It was therefore hypothesised that the patients with higher reported levels and/or duration of pain in CCU would have higher levels of catecholamine secretion as an objective indicator of stress. The sampling technique to be

used for the biochemical assay of urinary catecholamines was the reversed-phase ion-paired high performance liquid chromatographic (HPLC) separation system with reductive mode electrochemical detection developed by Bartlett (1992).

Despite the suggestion that the most reliable indicator of a patient's pain is their verbal report of pain, people still look for objective evidence of the presence of pain. In addition to the previously described biochemical measurements being used as indices of pain, Dalton (1989) reported 80% of staff said they would assess pain by observing behaviour. In comparison, only 75% of staff said they would assess pain using a direct question. Whilst undoubtedly the observation of non-verbal behaviour can provide information in some cases, evidence suggests that the assessment of pain intensity should not be based on the nurse's personal opinions or be influenced by their interpretations of the patients behaviour. Some reports have clearly shown that differences in the nurse's scoring of a patient's pain was influenced by the non-verbal behaviour of the patients e.g. when a smiling patient described pain most staff gave the pain a lower rating and only a small proportion (33-35%) of the nurses said they would increase the patient's dose of medication even when the previous dose had been ineffective (McCaffery and Ferrell, 1994).

In the study by Scott (1992) 85% of the staff surveyed thought that using a pain scale to prove the patients had pain was an appropriate purpose. This contrasts with the principles suggested by McCaffery who says 'pain is whatever the patient says it is' and the recommendations of the American Pain Society (APS 1992) that 'the clinician must accept the patients report of pain'. The APS added ' lack of objective signs may prompt the inexperienced clinician to say that the patient does not look like he is in pain'. Despite these recommendations, a study by McCaffery and Ferrell (1994) reported that the decisions of Australian nurses in pain management were strongly influenced by the patient's behaviour. It appears therefore it will be necessary to alter staff attitudes and behaviours in order to effect change in the practice of pain management. It has also been suggested that inadequate assessment and documentation of pain may be associated with lack of knowledge (Oliver, 1984). The effects of educating staff to reduce these deficits in knowledge has been the focus of many researchers. A brief review of the reported studies which have assessed the effects of educational programmes will now be presented.

1.10 The Influence Of Education On Pain Management.

The role of education in improving the standard of documentation of pain by oncology nurses was studied by Camp-Sorrell and O'Sullivan (1991). They provided one 45 minute duration teaching session then attempted to assess this effect over time by reviewing records after one week, one month and two months. Their results were disappointing as no significant difference in behaviour was demonstrated between the group who had been trained and those who had not. This supported the work of Oliver (1984) who studied the effects of short term continuing education workshops on clinical practice and found no difference in the behaviour of staff after the education classes which he measured by the reviewing the documentation of pain assessment in medical records. It was suggested that this may have been due to the lack of reinforcement of the techniques after the training was given. This expectation that a training programme will allow staff to assimilate new knowledge and practice new skills is the foundation for much of the continuing education offered today. Within the current study it was recognised that the nursing staff did not carry out a systematic assessment of pain, therefore the researcher wished to determine firstly what practice actually went on; and secondly whether the provision of an education programme related to pain and its management would alter staff behaviour and consequently change the process of pain assessment within the coronary care unit. The education programme provided was a full study day therefore of longer duration than the programme reported by Camp and O'Sullivan (1981). This work is discussed in more detail in chapter 3.

In addition to the suggestion that inadequate education can contribute to inefficient pain assessment (Camp-Sorrell & O'Sullivan 1991, Dalton 1989, Doverty, 1994; Ferrell et al., 1993, McCaffery and Ferrell, 1992, 1994) it can also influence the behaviour of staff in relation to the administration of analgesic therapy (Ferrell et al., 1992).

It has been repeatedly reported that nurses do not have an adequate understanding of the pharmacological properties of various drugs (Dalton, 1989; Ferrell et al., 1992, McCaffery and Ferrell, 1994; Marks and Sacher, 1973). Cohen (1980) reported that many patients experience a return of pain before the next dose of medication was administered. Studies in a hypothetical situation revealed between 46-67% of nurses would not increase the dose of drug administered even when the previous one has been ineffective (McCaffery and Ferrell, 1994). Numerous studies carried out since the late eighties have shown 31% of nurses studied in the USA (McCaffery and Ferrell, 1994; McCaffery et al., 1990; McCaffery and Ferrell, 1992b) and 22% of those surveyed in Australia (McCaffery and Ferrell, 1992a) still have exaggerated fears of addiction. A survey of 359 nurses in USA and Canada revealed that the nurses' decisions related to the administration of medicines could be influenced by the age of the patient. Staff appeared more willing to accept self reports from elderly patients than the middle aged, but still half the nurses reported that they would select a dose

which would under medicate the elderly (McCaffery and Ferrell, 1994). This confirms the reports of previous authors that under-treatment of pain is more likely to occur in the elderly (Short et al., 1990; Faherty et al., 1984)who may often not report pain as readily as a younger patient (Otto et al., 1985). The study by McCaffery and Ferrell (1994) reported that the pain assessments and interventions of Australian nurses were influenced more by the patient's behaviour than their age. In addition a only a small proportion of nurses (less than 12%) reported concerns about respiratory depression and tolerance, with even less (5%) having concerns about addiction (McCaffery and Ferrell, 1994). This contrasted with previous reports.

In relation to level of experience it was found that nurses in the first year of training inferred more pain than those in their second year which supported the hypothesis that nurses undergo changes during their educational development which can influence their inferences of pain and distress. To supplement the information already obtained and compare some of these results Mason (1981) completed a study to compare educational preparation of staff, employment status i.e. full or part time, age of the nurse, years of professional experience and age groups of the patient. The nurses studied were all practising in the field of adult nursing. Mason (1981) found no difference in the mean scores related to the nurses educational preparation, whether she was employed full or part time, her position of employment nor the hospital in which she was employed. Nurses with less than one years experience differed in their inferences of physical pain The nurses age did not affect the inferences made about the patient's pain, but the patients age did influence the nurse's judgement. In contrast to other reports (Davitz et al., 1981), Mason (1981) found a greater amount of pain was inferred in children than in those over the age of 65. The influences experience had on physical distress was still less than on psychological distress. This finding was confirmed by Dudley and Holm (1984) who studied a random sample of 50 registered nurses who worked in the general medical unit and a combined intensive/coronary care unit. In addition measures of job satisfaction were made which showed a weak relationship to assessments of patients' pain. Once more educational preparation, clinical practice and shift assignment were not associated significantly with ratings of pain and distress.

In summary, the reports in the literature suggested a variety of misconceptions are still held by staff related to their beliefs about pain and the possible interventions. Education of staff related to techniques in pain assessment and the pharmacology of analgesic agents has the potential to improve practice however further research is required to evaluate the effects of increasing staff education. Part of the work described in this thesis has attempted to identify whether an educational programme in a coronary care unit will alter the behaviour of nursing staff when they interact with patients who are in pain. The study undertaken and the results of this investigation will be presented in more detail later in chapter 3. At this

point the discussion shall digress to consider factors other than inadequate education which may affect the management of acute pain.

1.11 Additional Factors which can affect Pain Assessment and Management

It is possible in clinical practice that pain assessment may not be given the priority it deserves by nursing staff. This may be particularly true in the acute care settings where it may be overlooked in preference to more dramatic life saving interventions (Doverty, 1994). This situation was a potential problem in CCU as due to the acute nature of the patients' illness it was possible the staff may focus on the technical side and the 'drama' associated with the potential rapid deterioration in the patients' condition. The action of the staff and judgement of the pain intensity may also be influenced by the categories of illness for example cardiovascular disease, cancer, trauma or psychiatric disorders (Dudley and Holm, 1984). The clinical condition may indeed influence the attitudes of staff towards the patients pain; for example the patient who has extensive burns reported the same pain intensity as a postoperative patient who had undergone cosmetic surgery but when the nurses were asked to rate the patients pain and distress they felt the former patient had more intense pain and distress than the latter (Davitz and Davitz, 1981). A more recent study of pain assessment in the emergency department (Hoyt and Sparger, 1984) revealed that the staff made the most thorough assessment of patients who presented with chest pain. The authors speculated this was because patients with a cardiac problem were at risk of immediate life threatening deterioration of their condition and many such patients are admitted to hospital on the basis of their history alone. It has also been reported that staff tend to stereotype patients, and their assessments of pain may differ in relation to the nurse's cultural and ethnic background (Davitz and Davitz 1981, Donovan 1985) but are not affected by age, educational level (Mason, 1981) nor area of specialisation (Davitz and Davitz,1969). Pain assessment has been reported to be affected by the feelings the nurses themselves have towards pain, and indeed nurses who have had severe pain themselves have demonstrated increased empathy and understanding (Dalton 1989, Davitz and Davitz 1981, Holms et al 1989,). The effects of these factors can clearly influence the assessment of pain which will then direct any subsequent interventions and administration of medication.

Irrespective of the conflicting reports in the literature the assessment of pain requires improvement in clinical practice. It has indeed been suggested that although instruments for pain assessment may be difficult to develop they can offer a systematic method of assessing pain which has to be the foundation for adequate relief (Donovan, 1983). It has also been suggested there are advantages to measuring pain relief instead of pain severity.

Firstly the magnitude of the response does not depend on the initial pain severity. Secondly, it is not necessary to assume all parts of the scale are equal, and finally it is more common for patients to express themselves in terms of relief e.g. "my pain is a little better" rather than "my pain is now moderate" (Huskisson, 1974).

It is recognised that the assessment and documentation of pain may be influenced by the demands of the clinical setting, lack of accountability of the staff and by the complex interpersonal relationships which go on within the clinical environment (McGuire, 1994). Nursing staff may be inhibited by the organisational constraints to provide optimal pain relief as nurses are still dependant on the medical staff to prescribe analgesia. The drug administration may therefore be restricted within the limits of the prescription. It is therefore essential to encourage regimes offering flexibility. Even when adequate doses are prescribed staff may not administer adequate amounts (Marks and Sacher., 1973; McCaffery and Hart, 1976; McCaffery and Beebe, 1989).

It has also been suggested that in the influence of memory for pain should be considered when conducting research into pain control. I certain situations it has been reported that the recall of pain some time after the event may be influenced by perceptual biases. For example the accuracy of the memory for pain in patients with chronic pain showed distortions resulted in the recall of higher pain levels than were reported at the time of subjective pain ratings during treatment (Porzelius 1995). Another study assessing the difference between immediate pain assessment and recall of pain experience two weeks later following the removal of wisdom teeth, showed that the subjects memory for pain was only fair (Beese and Morley, 1993). In contrast there have also been reports of close agreement between actual pain experience and pain recall after 24 and 48 hours postoperatively (Babul et al., 1993). In a study of cardiac patients the accuracy of current chest pain records and the later accuracy of verbal recall in 31 patients revealed that patients who received instruction in the use of a chest pain discomfort diary at home recalled their chest pain more completely than the control group (Bascilicato et al., 1992). It should be remembered that the written recording of specific categories of information could have affected the ability to recall this information later. Despite the conflicting results of these studies it is important to be aware and consider the potential effects of time and recall on pain experiences and to consider these factors when discussing results related to pain assessment and patient communication in relation to pain.

Interaction between patients and a large number of health care workers occurs during the patient's period of hospitalisation. The group with whom the patient has most contact is the nursing staff. Nurses, during their contact with patients, communicate both verbally and non verbally. The influence of poor communication and its impact on pain assessment were alluded to in section 1.9.2 and 1.9.3. The importance of communication in the process

of pain assessment and management cannot be overemphasised and will therefore be discussed in the next section (1.12).

1.12 Nurse Patient Communication

Within the clinical setting of the current research it was not known how nurses communicated with patients who were in pain. The present study aimed to describe the communication process which occurred between patients who were in pain following a myocardial infarction and the nursing staff in a coronary care unit. It was of particular interest to observe the process of verbal interaction which occurred during the assessment of cardiac pain as it was felt this interaction could have a strong influence on the subsequent management of pain. There is a limited relevant literature available which will now be presented.

In order to promote the delivery of nursing care it is essential to have rapport between the patient and staff. The relationship between the two may be very intimate and there are many aspects of the patient's treatment which can affect the therapeutic outcome of the patient's hospitalisation. The effects of nurse patient relationships have been studied particularly in the field of psychiatry and it was emphasised by Freeman et al (1958)that the most important aspect in the therapeutic environment is the people in it. Nurses, in particular, have a significant contribution to make to this. The contribution of psychiatric nurses has been acknowledged but it is no less important in any other field of nursing. It has been suggested the contact between the nurses and patients may help to hasten recovery (Altschul, 1972). The nurses essential functions are associated with interpersonal skills which "*..have to do with the relationship between the nurse and her patient in their day to day contact with each other*" (WHO 1957). Within general nursing the positive therapeutic value of the relationship was perceived by the patient (McGhee 1961).

Interpersonal relations refers to everything that goes on between one person and another (or others) by way of perception, evaluation, understanding and mode of reaction(Gould and Kolb 1964). It was stressed by Mcleod Clark (1982) that interpersonal skills were an essential part of nursing and within this communication is fundamental. The activities of nursing incorporate a wide range of encounters and interactions between nurses and patients in a variety of circumstances. Weins et al (1965) suggest that many of the functions of a professional nurse can only be carried out through appropriate verbal communication. Mcleod Clark (1982) discussed the verbal skills which had been identified by other researchers which can contribute to the maintenance or breakdown of a conversation. As she stated the nurse who is verbally skilled should be able to successfully initiate, maintain, direct and terminate verbal interaction with patients. The skill of verbal

reinforcement or encouragement is important in the maintenance of conversation (Macleod Clark, 1982). Studies have also been completed which looked at the control one individual can have over another. Therefore the use of verbal reinforcement by the nurse can have the effect of directing the conversation to important or relevant topics. One of the basic skills used in verbal interaction is that of questioning. The type of question can also affect interactions. The use of closed questions with a restricted response can be useful for collecting facts quickly and they can help focus the conversation. It is important however to recognise that if used habitually they can inhibit the development of an interaction (Ivey and Authier, 1978). There may be even stronger control of the interaction by the use of leading questions which can direct the respondent as to how they should answer. In contrast to closed questions the use of open questions for example "How are you feeling?" allows expression of opinions, attitudes and feelings. It can be seen from this brief summary that the nurses use of these verbal techniques could influence the progress of any interaction with a patient. Mcleod Clark (1982) suggested that in addition it should be possible to improve any nurse's ability to gain information from a patient by simply developing the relevant skills. Nurse educators reported the need for good communication was recognised and advocated, however the examination of course syllabuses revealed communication skills were not explicitly taught. This suggests what is advocated as being important is not actually taught.

Nurse patient interactions have been studied in the past One method of content analysis was described by Schutz (1958) as the Binary method, in which the content categories are arranged by levels of decision making. This involved first deciding whether the nurse elicited the information from the patient or did not. If the nurses did obtain the desired information then a second decision was required by the judges to determine the nature of the elicited response. Within the area of analysis of nurse patient interaction, work has also been carried out to classify behaviour into therapeutic and non therapeutic techniques using classification systems, the best known by Hays and Larson (1963). Topf (1969) designed a classification system of over 80 items to evaluate and assess the communication skills used by nurses in the USA to describe effective behaviour i.e. responses which usually facilitate the communication process. Ineffective behaviour was described as responses which usually inhibit the communication process. Topf then analysed process records and tape recordings and rated the ability of student nurses to interact with patients. The development of the nurse orientation system (NOS) by Diers and Leonard (1966) provided an alternative approach to allow analysis and quantification of dialogue within nurse-patient interactions. This was derived from a theoretical perspective related to the way in which a nurse is orientated to a person or an object. This was abstracted from 'communication theory' as it was argued the nurse and patient communicate because of actual or anticipated needs related to the patients health. They also stated the labels of nurses and patient clearly identify the roles and relative power held by each. Further work has been done in which three different approaches to nursing were identified using the NOS

and the nurses could deliver any physical care they wanted to but their verbal interactions were modified. It was hypothesised that the patients who received holistic nursing care which addressed their physical, cognitive and emotional needs would experience more pain relief than patients who were viewed as having only cognitive and physical needs or purely physical needs. The study involved 30 surgical patients (10 in each group) who received medication when they complained of pain. In addition the nurse spent about 25 minutes speaking to the patient using the approach assigned. The patient's pulse and respiratory rates were measured before, immediately after and one hour later. Judgements of verbal and non verbal behaviour were made on a three point scale: worse, better or the same. The results did not show a significant change in pulse rate although the trend was towards a greater reduction in pulse rate in the group who participated in the 'feeling' interaction. Non verbal behaviour ratings were significantly different between groups again with most effect in the 'feeling' assigned group. Patients verbal responses to pain relief were shown to differ significantly between the 3 groups. The use of the NOS system is complex and requires intensive training. The studies in which it was used also had inherent problems in their design. The nurses knew which group the patient was assigned to therefore the hypothesis of the study it was likely to be highly biased.

An attempt to provide more precise definitions of communication skills and behaviour in nursing was described by Reiter and Kakosh (1963) who produced a framework of skilled behaviour in relation to the spoken, listening and observing elements of communication. This then resulted in criteria being derived for three levels of communication in nursing which were elementary, technical and professional. The authors admitted their proposals were limited and unrefined but did provide a framework for American nursing. Attempts have also been made to use real life incidents as the basis for defining an analysis framework. In 1970, Graffam studied responses to patients who were distressed using non participant observation. The study involved 75 trained nurses and 157 distressed patients. The nurse's interaction was classified on a framework to enable immediate classification of all events which occurred immediately after the distress episode. Graffam did achieve high inter-rater reliability despite a lengthy framework but acknowledged the methodological problems, which included the nurses reactions to the research process. Staff tried to avoid the observer and often exaggerated their responses to the patients which may well have biased the data.

Other techniques have included analysis of the relationship between attitudes held by nurses and the content of the interviews by word counting techniques. This revealed the attitudes of staff when interacting with terminally ill patients (Mood & Lick 1979). Significantly more negative words were used when the interactions were death related. A subsequent study (Mood and Lakin 1979) looked at the use of the impersonal pronoun 'it' when nurses described their feelings about caring for the terminally ill and it was found the pronoun was used significantly more when subjects described patients, relatives or

nurse's reactions to death, than when describing physical care. These techniques were not used in these studies to analyse interactions. They were used to analyse nurse's feelings and attitudes to aspects of care.

Within the UK little has been done on the analysis of nurse patient verbal interaction and most of what has been done concentrated in the field of psychiatry and mental handicap nursing (Altschul 1972, Paton and Stirling 1974, Moores and Grant 1976, Macilwaine 1980). The interactions which would occur in these settings would necessarily differ from those in the context of general nursing, which have been described by Macleod Clark (1983) and Faulkner (1980), and more specifically in intensive care by Ashworth (1980). A review of this work shows important methodological problems. Moores and Grant 1976 showed the difficulties of on the spot coding of verbal interactions, while Macilwaine (1980) demonstrated the potential for radio microphone use in the collection of data. Faulkner (1980) attempted to determine the student-nurse's role in giving information to patients, and in her study the use of a radio microphone allowed the collection of data on conversations between nurses and patients on general medical wards. Faulkner (1980) found that the interactions were predominantly task orientated and the behaviours recorded most often were those of instructions or requests and their subsequent responses. Provision of information or fulfilling a health education role was infrequent. The transcription of information was selective and the analysis may have been limited. The researcher did not use any additional coders in her study which reduces the reliability of the data.

Macleod Clark (1983) was aware of the limitations in previous work related to the exploration of the content and mechanism of nurse patient verbal interaction, especially in general nursing. Unlike the study by Macleod Clark (1983) in which the first three months involved working on the ward area as a participant observer to gain an overall picture of the nature of verbal interactions which occurred between the patient and the staff, the investigator was still currently employed as a member of the nursing team within the unit where the study took place, and therefore already had access and insight into the verbal interactions which took place between nurses and patients in a CCU. It was necessary to develop a more systematic approach to collect data related to nurse patient communication within a coronary care unit, and a variety of techniques were considered which will now be described.

1.12.1 Techniques Considered for the Accumulation of Information Related to Nurse Patient Communication in CCU.

The use of tailing, lurking and eavesdropping in conjunction with hand written observer notes or records has been used in previous studies (Macleod Clark, 1982). Lurking involves the collection of data by overhearing conversations which occurred in the ward

from a 'lurking' position. The researcher may be positioned behind the screens while trying to remain as unobtrusive as possible to the patients. Not only is this uncomfortable for the researcher it is also very difficult to gather information without the staff becoming very self conscious. It is also practically difficult to record the information when trying to observe the interaction at the same time. The alternative of using precoded sheets to record the information can lose the content and context of much of the information. In addition coded information may be inconsistent.

A second technique was the recall of an individual's own interaction and conversation with patients. In reality it is very difficult to do accurately. The gist of the conversation may be remembered, but the detail forgotten even if completed soon after the event. The authors reported this gave rise to practical problems as it would often not be possible to stop an interaction or be free immediately afterwards to record the event in note form. It was therefore thought the objective recording and collection of staff-patient verbal interactions would be more useful.

This involved gathering the information using a standard cassette recorder, as had previously been done by researchers recording information about the verbal exchange between doctors and patients (Byrne and Long 1976) and nurses and patients (Mcleod Clark 1982). In the work by Mcleod Clark (1982) difficulty was experienced in categorising the data into the frameworks developed by either Topf (1969) or Hays and Larson (1963). In addition to verbal interactions, the non-verbal behaviour which occurred simultaneously was observed using a videotape, therefore a new framework to categorise the data was developed. This was generated from the researchers observations. This work related to a more detailed analysis than was required in the present study.

Each of the studies considered above has described a technique for the examination and analysis of nurse patient verbal interactions but their relevance to the current research is limited. The studies which have used techniques more similar to the methodology employed in this research study will be described in chapter 2. Methods allowing the collection of data using tape recordings of the nurse patient interaction were of the greatest interest to the researcher. Whilst valuable insight into the use of interaction analysis techniques was gained however none of the techniques were thought to be entirely appropriate for the analysis of nurse patient interactions in this study. The methodology and results which are presented in chapter two concern studies of the interaction of nurses and patients within a coronary care unit, as this has not been previously reported at the time of designing and conducting this research. Subsequently however a Study by Guyton-Simmons and Mattoon (1991) identified strategies utilised in clinical practice by experienced critical care nurses in the assessment and management of pain. This revealed that nurses used short effective questions and observations for cardiac pain assessment.

The process of communication between the nurse and patient is obviously important in nurse patient interactions as this can direct the nurse's clinical judgement. It is evident that the decision of how to treat a patient's pain is the result of a complex process of nurse-patient interaction. The behavioural and cognitive processes which occur during this interaction were described by the researcher in an attempt to create a conceptual model which would guide the planned research study. The consideration of the steps in this process led to the development of two models; the first described current nursing practice where the nurse administered bolus doses of opiates intravenously to the patients. This was named Nurse Controlled Analgesia (NCA) which is represented in Figure 1.4. The second was produced to allow the comparison of another method of analgesic administration for patients with a diagnosis of myocardial infarction in a coronary care unit. In this instance the patients could self administer opiates using a patient controlled analgesia system which is described in detail in Chapter 2. This second model was named Patient Controlled Analgesia (PCA)and is represented in Figure 1.5 (see overleaf).

Figure 1.4

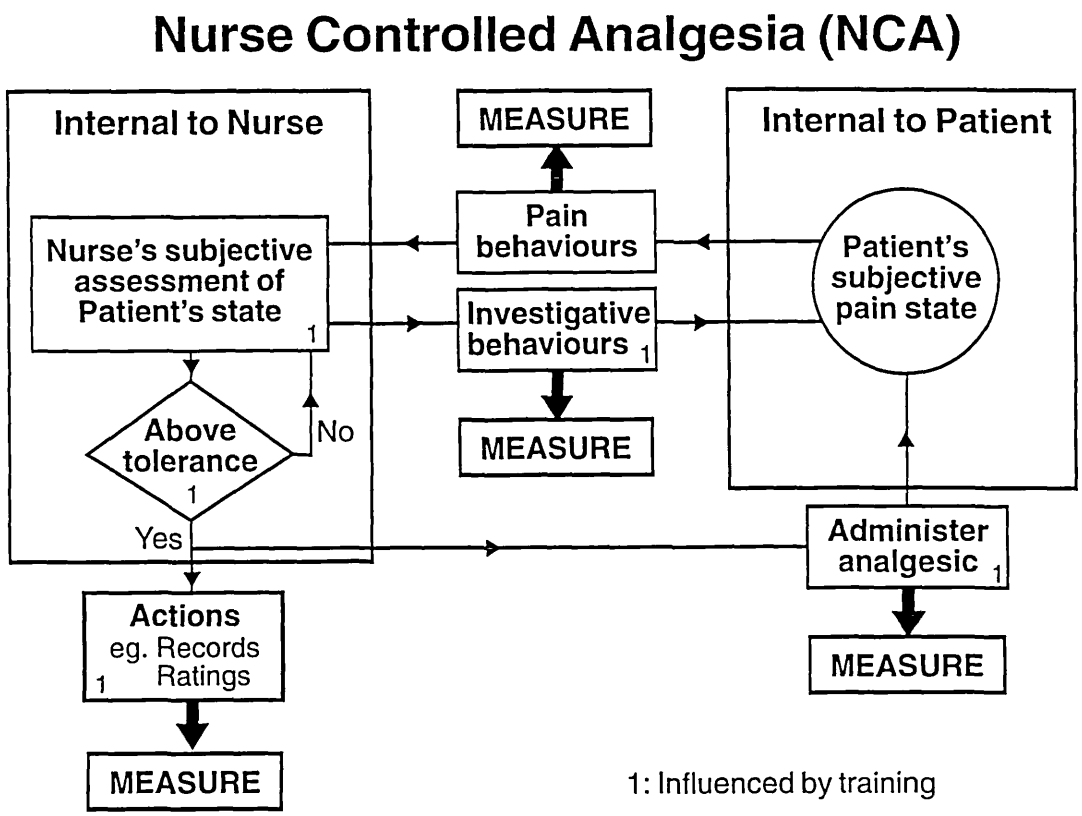
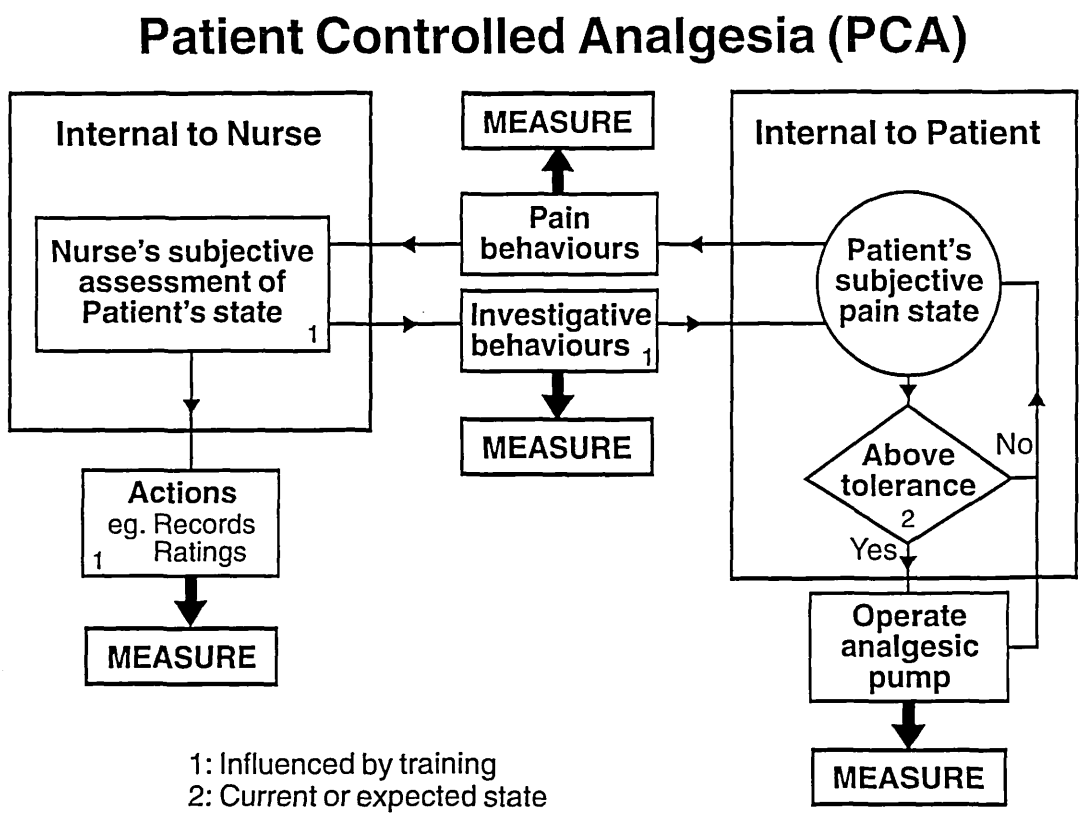


Figure 1.5



1.13 Conceptual Models For Pain Management

The NCA model demonstrates the various steps in the interaction from the point at which the patient experiences pain and the intensity increases to a level he perceives as being painful. After the pain intensity exceeds a critical point he will report his pain. The subjective nature of pain makes it impossible for nurses to make a direct measurement of the patients pain, therefore the only way staff can elicit information about the patient's pain is to get this information from the patient (McCaffery et al., 1989). The behavioural and physiological signs of pain are unreliable indices of pain and the patient's self report of pain remains the most useful index (Houde, 1982). The process of pain assessment as previously discussed in section 1.9, 1.10 and 1.11 is open to influences from both the nurse and the patient.

Having obtained information from the patient the nurse makes an inference about the patient's pain state and a decision about treatment. If the nurse decides the pain is not above a tolerable level then no subsequent action may be taken. If the nurse decides that the pain is above a tolerable level the nurse may intervene by administering an analgesic (within the prescribed dose range) which the nurse thinks is appropriate. The nurse may also carry out other actions to assist in the assessment of the patient's pain for example use a pain assessment tool, or record a 12 lead ECG. Having made an assessment, planned and completed an intervention to relieve pain, the nurse would normally document this action and evaluate its effects. By highlighting the stages in this complex chain of nurse patient interaction it was apparent that it should be possible to measure the activities which occurred at certain stages of the interaction. Within the nurse-patient interaction two main factors which could impair pain management were highlighted; (a) the nurse dependant on his/her communication and assessment skills could fail to gather adequate information or (b) he/she could misinterpret the acquired information. This could then result in inadequate treatment of the patient's pain. In relation to the patient's contribution to the communication process, non-reporting or denial of pain and discomfort could also result in inadequately controlled pain. The nurse and patient could therefore independently influence the effectiveness of pain management. Inadequate input from both parties would have a cumulative effect and contribute to the under management of pain following myocardial infarction. Examination of these processes emphasises the importance of good communication and the need for staff to be skilled in the techniques of verbal communication, as in this situation this may be the crucial factor in determining the presence and intensity of the patient's pain.

The description of the second model (PCA) will show the differences which can occur in the nurse patient interaction process and the subsequent delivery of analgesics. PCA was based on the same sequence of events but in this case the patient was not dependant on the nurse to receive analgesic therapy. The patient had the ability to self-administer analgesia

when his subjective perception of pain reached a level beyond the patient's tolerance. The patient makes a personal judgement as to when analgesia is required . This relieves the patient's dependence on the nursing staff, provides the patient with some control over his/her own pain management and avoids many of the potential misinterpretations which could occur when communicating about pain. The concept of PCA will now be discussed in more detail.

1.14 Patient Controlled Analgesia

Patient controlled analgesia (PCA) was first reported by Sechzer (1968) as an alternative method of drug administration in the management of pain. Sechzer described a technique in which patients who were recovering from surgery were instructed to press a button when they felt pain. At this time a nurse observer then administered a small dose of intravenous drug, either pethidine or morphine, and evaluated the effects of this action. This technique had demonstrated the cyclical nature of pain, and the wide variation in analgesic requirements between patients. Despite this, it was described as an effective technique for the management of post-operative pain. It did however place a great demand on nursing time which could inhibit its acceptance in clinical practice. This led to the search to develop mechanical apparatus which could allow self administration of drugs by the patient. PCA systems consist of an infusion pump electronically connected to a timing device, which the patient triggers by pressing a hand held button. When a successful demand is made the lockout interval is also activated. The lockout interval is pre-programmed by the staff to prevent the additional administration of medication until a specified time period has elapsed and the first dose has had time to exert its effects. It also acts as a safety feature to prevent overdose of the drug by repeatedly triggering the device. The first device developed which was commercially available for the use of patients was the Cardiff palliator (Evans et al., 1976). Since its original development technological advances have led to the production of a variety of PCA systems which have been tested in a number of clinical areas. PCA has been established as a valuable method of pain relief in surgery (Bollish et al., 1985), obstetrics (Eysenach et al., 1988) and oncology fields (Citron et al., 1986) as well as being assessed in burns (Kinsella et al., 1988) and paediatric patients (Gillespie et al., 1992).

Research has focused on the development of new analgesic agents and but the opiate drugs remain the cornerstone of parenteral analgesic therapy. Relatively few innovations in analgesic therapy had been widely accepted which supports the broad appeal of the opiates efficacy and safety record. The concept of PCA allows the removal of the problems previously described associated with the prescription and administration of medicines. The benefits of PCA were described by Bennet et al (1992) as avoiding delay between pain perception and analgesic administration, no feelings of helplessness which were often

associated with excess amounts of drugs and the fact that the patient not the nurse or doctor controls the use of the analgesic. In addition it has been reported as having a more rapid onset of action, the size and timing of the increments can be adjusted to provide optimum analgesia. This contrasts with the traditional methods of analgesic administration which has multiple factors which affect the absorption and distribution of medication. In addition, the procedures required for the administration of medicines often resulted in unacceptable delays. The benefits may be readily seen by considering the character of conventional analgesic therapy which was described by Graves et al (1983) (Figure 1.6). The cycle the patient goes through to receive pain relief consists of many steps, each step can postpone pain relief and a variety of factors can contribute to delays between the perception and the relief of pain.

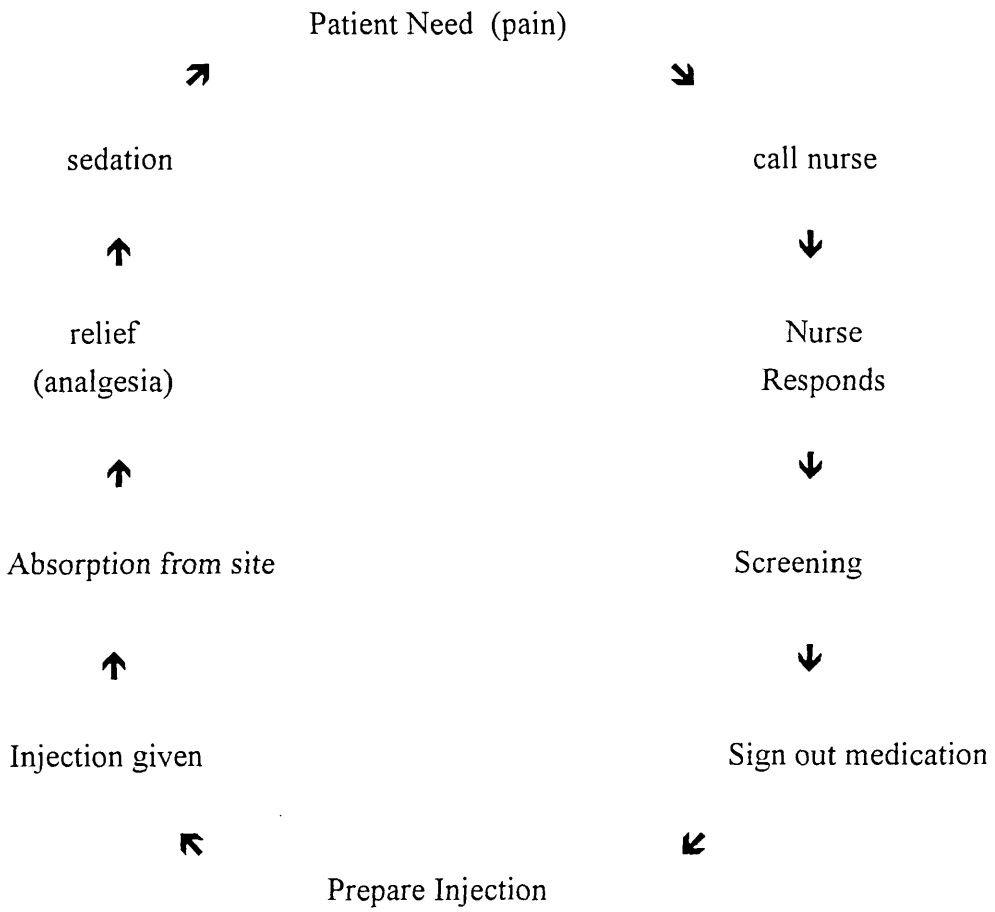


Figure 1.6 The cyclic character of conventional analgesic therapy (Graves et al. 1983)

The patient initiates this sequence of events by calling the nurse but the issues of reluctance to do this and non reporting of pain have previously been discussed (Section 1.9). There may be a delay in the nurse's response time which has been estimated to be at least 30 minutes (Vache, 1982). The screening procedure corresponds to the nurse's assessment of pain and decision making process influencing subsequent intervention. Having decided on an intervention it is then necessary to prepare the drug for administration and complete the appropriate documentation, which will further delay administration of the drug. The route

of administration as well as the drugs pharmacokinetic and pharmacodymanic properties will determine its onset of action and the time until the pain is controlled. The delivery of drugs in this manner contributes to the peak and trough effects which can be seen overleaf in Figure 1.7

The peaks in analgesic plasma concentrations are often associated with sedation although specific effects are dependant on the dose administered. The rapid excretion of the analgesic then results in a reduction in levels of analgesia below the therapeutic range, which results in the return of pain. Often in this situation the prescription restricts dosing within a specified time period. If the pain has returned within this time period then the patient has two possible choices; they can wait until the time period is up and another dose of analgesic may be administered or they can request the dosage interval be changed. Whichever course of action is followed, this will result in a period of stress and anxiety for the patient which may then increase the patient's experience of pain. Even if they do make a request for additional analgesia, there could be a delay between the request and the administration of the drug. In the traditional cycle of analgesic administration the drug often has been administered by intramuscular (IM) injection. The problems with the delivery of drugs via this route is that they have a variable absorption and distribution which may be influenced by alterations in cardiac output and perfusion, thus causing a delay in the onset of action. In addition the intramuscular route of drug administration is not recommended for the reasons previously discussed (section 1.6). The normal route of drug administration is therefore by intravenous (IV) injection. This results in a more rapid effect, providing pain relief and reducing associated distress. The administration of bolus injections however will still have this peak and trough effects between episodes of under-analgesia and over-sedation. In attempts to minimise the plasma fluctuations the use of continuous intravenous infusions has become a useful alternative method of analgesic administration. The resultant plasma concentrations remain relatively stable for each patient but the minimum effective critical concentration differs. Consequently the difficulties in this method of drug delivery has primarily been the selection of an appropriate dose for the individual's requirements.

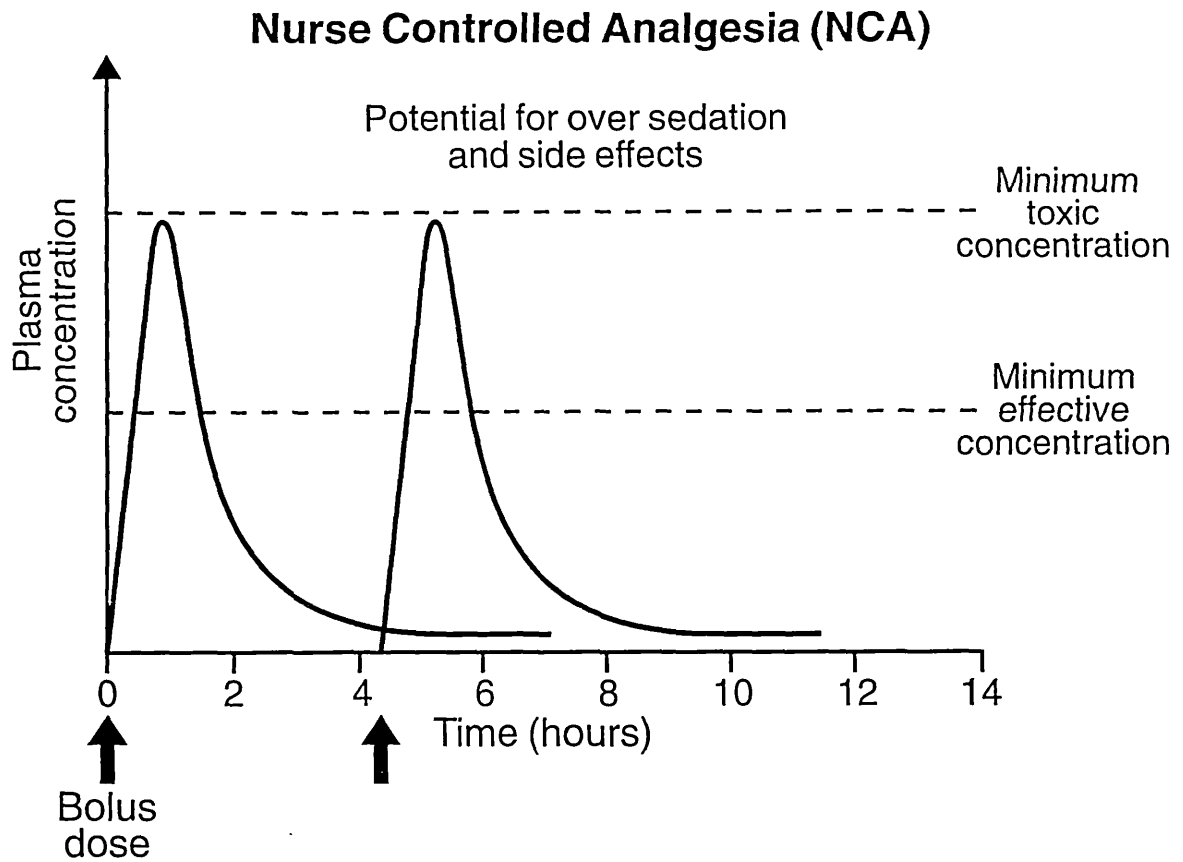


Figure 1.7 The peak and trough effects of intermittent bolus injection

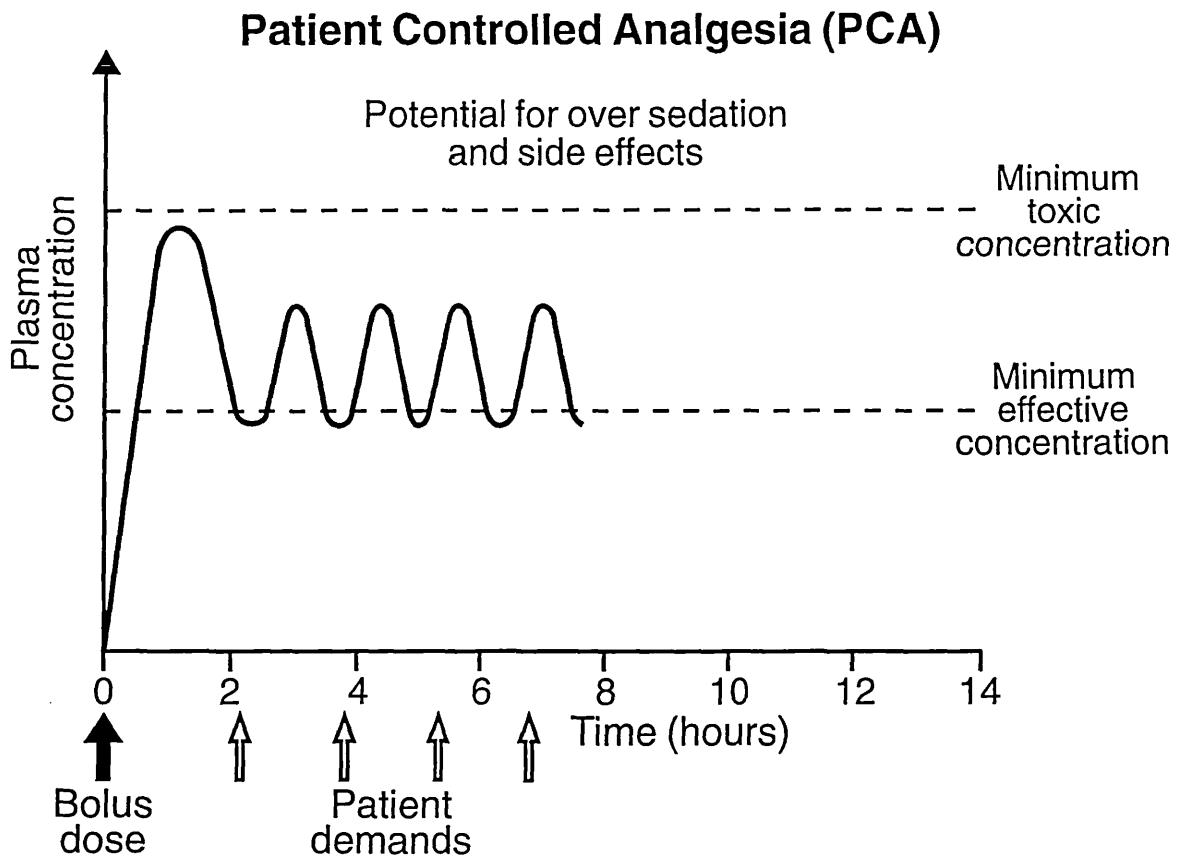


Figure 1.8 Titration of dose to meet individual demand using PCA

There may also be difficulties associated with the circadian variations in narcotic receptor sensitivity which will result in variable requirements of drugs at different times. The periods of increased receptor sensitivity may result in periods of over-sedation and inadequate analgesia when opiate receptors have reduced sensitivity. The success of these methods is therefore still dependant on the skill and judgement of the medical and/or nursing staff who control and adjust the dose. Most success with the use of IV infusions has occurred when a request or demand function has been included as part of the therapy. Nayman (1979) has used a complex light indicator system which allowed the patient to indicate his level of pain to a health care professional who could then alter the infusion rate accordingly. The subjects reported better analgesia to that received by IM injection however a deficiency still existed in the inability to predict an ideal infusion rate and accommodate differences between patients.

These delays and deficiencies described by the previous routes of analgesic administration can potentially be overcome by the technique of PCA. The initial studies showed patients could effectively titrate their dose by balancing analgesia, sedation and side effects. The early investigations also allowed the concerns of opiate misuse to be overcome. The reported studies of PCA have shown its benefit in pain management but as with all treatments there have been some reported instances of adverse reactions when using PCA. Tamsen et al (1992) reported two instances of profound respiratory depression. The patients were hypovolaemic and symptoms were reversed after adequate fluid replacement. There have also been reports of the placebo effect of PCA. Sechzer (1971) evaluated a placebo solution and found that 6 out of 45 patients could remain on inactive control medication for the whole of the test period. The patients were observed for only the period of 6-24 hours. Kerri-Szanto (1979) altered the dose delivered to 34 post operative patients and found the dose delivered did not significantly affect their pump activation rates. They responded to dosing rather than the amount of drug delivered (Rowbothan, 1992). This potential placebo response was challenged by Tamsen and co-workers who in two separate investigations were unable to delineate a placebo responder group. What their investigation revealed was there was a continuum of drug need, which correlated with wide variations in endorphins and substance P concentration in the cerebrospinal fluid. The effects of the circulating endorphins on the modulation of pain control have been widely studied by workers with an interest in pain and its management. Recent work has further supported the absence of a placebo response in postoperative pain (Thomas, 1991).

The most extensive evaluation of PCA has probably occurred in the area of acute post operative pain, following on the recommendations of the report Pain After Surgery (The Royal College Of Anaesthetists and Surgeons of England, 1990). The success of the systems in providing safe and effective analgesia has led to widespread developments and use of PCA. The interest in this method of drug administration has expanded into other areas e.g. paediatrics, burns etc. One of the most frequently reported benefits of PCA is the

feeling of control which is offered to the patient. The concept of control will be discussed in the following section (1.15).

1.15 The Sense of Control.

Theories of human behaviour differ in their assumptions about human nature and are therefore divided on the issue of personal control. The humanistic approach believes we have complete control over our behaviour (Rogers 1980), in contrast however Skinner and his followers believe we are controlled by external rewards and punishments and free will is a figment of our imagination (1971). There are a number of variations in beliefs which lie somewhere between these two extremes. The illusion of control is perhaps more important than actual control over events. Our belief in our ability to influence events makes the world seem more predictable. A particularly powerful example of the power of a belief in control was the study of elderly people in institutions carried out by Langer and Rodin (1976,1977) who suggested the reasons for debility of the elderly was the fact they were given no control over their lives in the institution. Prior to their residence there, they had been responsible for making decisions about all aspects of their lives on a daily basis. Their residence in this nursing home placed them in a decision free environment where the control is in the hands of others. They believed such psychological factors were as important as physical factors on determining well being. Their hypothesis was tested by dividing the residents of a Connecticut nursing home into two groups; the first received a message that stressed the staff's responsibility for them and their activities. They were each given a plant but told the nurse would feed and water this, they were also told they would be allowed to see a movie but the nurses would inform them which movie this would be, where and when. The other group in contrast were told the things they could do for themselves, such as arranging the furniture in their room, or deciding how to spend their time. They were also given a plant but allowed to choose which one, told that they should accept the responsibility to water this. They were also told that a movie would be shown but they could choose which one, when and whether they would view it. When they were questioned three weeks later members of the second group in which personal control had been emphasised reported significant increases in happiness. Staff judged the mental outlook of these patients to be improved and reported substantially increased activity amongst the group. Even attendance at the movie was greater amongst this group. More dramatic affects were seen when the researchers returned 18 months later. Staff continued to rate the group whose responsibility had been encouraged as more active, sociable and more energetic. Physicians also rated their health as better. The most striking difference was in fact mortality rates of the two groups. Thirty percent of the residents in the more dependant group had died where as only 15% of those in the other group had died which suggested the power of importance of control in a persons life. It is however true people

vary greatly in their beliefs about control as was suggested by Rotter (1966) in the concept of Locus of Control (LOC).

There is a need amongst humans to have control over their behaviour and environment. In social psychology the attribution theory is concerned with the way in which people interpret certain causes and behaviours. There has recently been more interest in the implications that these theories have in the fields of health and illness, especially in people's reactions to coping with serious illness and in actively taking preventative actions. Most research on this social psychological approach is known as the health belief model (Becker et al 1977, Rosenstock 1974). This model suggested that specific health beliefs govern the individual's decision to undertake health related actions. The way a person explains and interprets the cause of a particular illness can influence subsequent behaviour. The health belief model postulates that the decision of the individual to undertake health related actions is governed by specific beliefs which meet the patients perception of the efficacy, costs and benefits involved in the recommended health action. The evidence within this expanding literature related to how people perceive or interpret illness suggests this can have a profound effect on their ability to cope with the illness and on their tendency to employ preventative measures.

This application of this model to the issue of compliance with treatment and drug therapy, in the short and longer term situations has succeeded where many others have failed, to explain the problem of non-compliance by providing a patient centred approach to health care decisions. The theories of LOC developed by Rotter (1966) were an attempt to characterise individuals in terms of their feeling they can control the outcome of their behaviour. A person described as having an external locus of control would be the type to believe that events can be controlled by external influences. In contrast the person with an internal locus of control would believe he can influence events by his personal behaviour. This theory has been applied to health and resulted in the development of a health Locus of Control Scale (Wallston and Wallston 1978). The use of this scale found the people with an external LOC took less preventative measures than those with an internal LOC. Other evidence (Auerbach et al 1976) suggested enhancing people's feelings of personal control can help their ability to cope with pain after surgery. This may effect the behaviour of people following myocardial infarction both in the immediate period and in the longer term. When people are in a position of uncertainty and anxiety, this often results in them behaving in a manner to regain some control over an inexplicable or distressing event. This is a coping mechanism in an attempt to regain control. The best example of this may be that of 'self blame'. This response dependant on the situation and resultant behaviour may be seen either as an adaptive response or a maladaptive response. Self blame has also been associated with the type A coronary prone personality, who often had a strong need for control (Glass, 1977) which may result in the denial of symptoms which could have severe consequences. These reports suggest that an increased understanding of attribution

processes would be invaluable in assisting health care professionals to empower patients. This would be of benefit in taking drugs more effectively and wisely. This could be achieved by helping patients to make correct causal assignments to the drug, their disease and other environmental factors. This could increase their compliance with therapy and give them more control over their health. This acknowledges the importance of modifying patient explanations and the treatment of their physical condition. Adapting our explanations could increase patient understanding and encourage modification of behaviour. The recognition of the cause of cardiac pain and the importance of its control may help prevent the continuation of unreported pain and inadequate analgesia. In addition the option to allow the patient control over their drug therapy could reduce anxiety and need for control. The potential of the attributional approach to health care is emphasised by Strick and Bursky (1988) who stated '*Attributions are... an important vantage point from which to study doctor-patient communication and interaction, patient adherence to medical regimens and the implicit cognitive processes occurring in physicians when they explain illness to patients*'. This has equally important implications for nursing staff in their role as carers, information givers and educators when they interact with patients in pain.

The concept of control can be very important to patients. Patients may be overwhelmed by admission to hospital and those with an internal locus of control may be particularly upset by the helplessness created by this situation. Patients who are admitted to CCU have usually come in as an emergency, often from home or work, and have been previously engaged in the business of their daily lives. The sudden onset of their pain and associated symptoms may be very alarming for them. They have been rushed into hospital, had a barrage of questions and tests done on admission and after a rapid initial assessment have been diagnosed as having an MI, treatment commenced and invasive lines and monitoring equipment attached to them. It is understandable that they feel very vulnerable and completely out of control. This feeling may be alien to them as they may be used to being in charge of their lives and decisions. They find themselves at the mercy of both doctors and nurses. They may be frightened, fear their impending death at that time and they are also faced with greater uncertainty about their future. It can be especially difficult for those who must institute and carry out self care at home to regain control after discharge. The degree and nature of control exercised by the hospitals and the consequent reactions of the patients may have both short and long term impact on the person's health. The tradition was to treat patients as inanimate objects who had things done for them and often they were given little information about their care and treatment. Thankfully these traditions are passing. The move in health care at this time is to encourage active participation of the patient in his care and recovery. He is encouraged to question, provided with information from which to make informed choices, and thus allowed to exert some control over his care. Loss of control and of social relationships produces so many negative results that patients must be encouraged to actively participate in their care. The emphasis is on

returning the responsibility for healing on to the hands of the patients. Perceived control involves the sense of freedom of choice and awareness of opportunities. It has been suggested that the individual's sense of control strongly influences the ability to cope with stress and might actually decrease the effects of painful stimuli (Thomas, 1991). Changes in the delivery of care should allow patients to receive more information about the nature of their medical condition and the likely events which may occur during this illness.

The effect of behavioural control on pain has been extensively studied in the past. This is defined as the availability of a response which influences an event (Thompson, 1981). The ability to have control has generally increased the individual's tolerance to pain. For example subjects who were allowed to administer their own electric shocks demonstrated higher pain thresholds and greater pain tolerance than those who could not control the stimulus (Staub, 1971). It was suggested by the authors that the major influence is the predictability rather than the control itself. Pennbaker et al (1977) completed experiments related to the effects of a noise burst. The subjects who had no control over the stimulus complained of more physical symptoms than those who were given control. The subjects were allowed the potential to control the impulse but were asked not to do so; all of the subjects complied with this request. This suggests the perception of control was perhaps more important than the ability to control the stimulus. As previously stated the move is towards encouraging patients to participate in their care, therefore allowing the patient the opportunity to select their desired method of pain relief which may influence its effectiveness in relieving pain (Moss and Myer 1966).

The type of control the person may have can vary. In its simplest form this may be by the provision of information to the patient. This information may be related to the timing of the event, planned care, characteristics of what is likely to happen, or the likelihood of experiences which may be felt. In the study of post operative pain the provision of information preoperatively has been shown to reduce the experience of post operative pain and enhance recovery (Johnson, 1973). This situation cannot be replicated in the care of patients with myocardial infarction as there is no opportunity to visit them and educate them prior to the event. The importance of offering control in this situation therefore has to relate to the provision and reinforcement of information during the acute phase of their illness. It is important to ensure that they understand what has happened, the reasons for the pain and its meaning. In certain circumstances the teaching of patients about interventions they could participate in to promote their recovery, showed benefit in improving ventilatory function and reducing hospital stay but it did not reduce the amount of analgesia used. It is possible this may be due to them being better informed they were keen to participate to actively improve their recovery and in doing so had ensured they received adequate analgesia to make this possible which may actually have been more than they would have requested if the had opted to make a less active more sedentary recovery. The use of reinforcement of information related to likely experiences the patients would

feel in a study by Johnson (1973) resulted in a reduction in analgesic requirements in the group who had information reinforced as opposed to the group who had only preoperative information. This again suggests the benefit of reinforcing the information. Information related to the actual experiences the patients may have is likely to be the most useful. The question arises as to whether there is a role for the use of cognitive control measures such as distraction. This has been reported to increase pain tolerance in laboratory experiments (Luker and Ray 1982). Evaluation in the clinical setting in surgical patients compared cognitive control against the delivery of information and reassurance. Those employing the strategies of cognitive control directed their attention away from the negative events using distraction and selective attention to focus on more favourable aspects of their experience. The group utilising this technique were reported to be less anxious than the control group receiving information and reassurance only. Fewer of the patients in the interventional group requested analgesia and sedation postoperatively. These techniques have not been reported as strategies in the management of cardiac pain in the acute situation but practical problems may arise due to the patients receptivity to teaching at this time. It is possible the short stay in the CCU unit would not allow adequate learning as it would be suspected that the utilisation of these techniques would improve with practice and instruction would be required on more than one occasion. A more widely practised approach is the use of relaxation techniques to help minimise the aversiveness of the situation. Flaherty and Fitzpatrick (1978) taught patients a relaxation technique which involved the muscles of speech and mechanisms of biofeedback. The result of this group in comparison to a control reported lower distress ratings and levels of pain. They also had a lower narcotic analgesic intake. The timing of these techniques may be fundamental to their success as an extension of this study by Mogan (1985) did not support these previous results. In addition to relaxation techniques they also attempted to include the use of imagery and distraction. The only difference was the distress associated with pain was reduced which it was suggested may have been due to the inability of patients to absorb a number of different strategies the night before surgery. The issue of reinforcement of information was again supported by Wells in his study (1982) who found patients who received post-operative reminders to use a relaxation technique taught preoperatively reported lower pain distress ratings than the group who received pre-operative instruction without post operative reinforcement. The technique was only taught on one occasion.

The use of PCA has been suggested to allow the patient to exercise some form of control as the patient has the power to minimise his pain experience. This has now become routine practice in many surgical wards. Many of the studies have been limited by their small sample size and other weaknesses in the methodology. There had only been one reported case of the use of PCA in myocardial infarction (Eltringham et al., 1983).

The PCA device used in this study was the Cardiff Palliator. Thirty one patients diagnosed with myocardial infarction were included in the study. All were instructed in the use of the

PCA pump which contained 40 mg of morphine in 20 ml of normal saline i.e. a concentration of 2 mg per ml. The patients were instructed to activate the pump when the pain returned. At this time they received incremental injections of morphine 0.1mg/kg. The increments were delivered over a 4 minute period to minimise any potential cardiovascular or respiratory complications and the lockout interval set at 20 minutes. The patients pain relief was assessed by the nursing staff 10 minutes after each dose and reported as either none, partial or complete. Five patients required no further analgesia following admission. Of the remaining 26 patients, the average analgesic dose was 28.46 mg (+/- 16.44), the average interval between doses was 4.5 hours (+/- 3), and the average number of doses was 4 (+/- 2). Complete pain relief was achieved in 81% of patients; of those with incomplete pain relief further doses were given after 20 minutes. Within this study no significant side effects were seen and patients reported feelings of increased confidence and reduced anxiety as they had the PCA pump by their bedside. This study suggested the use of PCA in myocardial infarction could be used without any additional burden to the nursing staff. The weakness in this study was this was not directly compared to a group receiving therapy in the conventional manner therefore it was difficult to ascertain whether this treatment was better or worse than conventional therapy. No evidence was reported related to the drug requirements, dose intervals or number of doses administered to MI patients who were not receiving PCA. The dose given was titrated according to the patient's weight which has since been reported as not necessarily being a valuable measure of requirement. The drug given was morphine which was not used in daily practice within the coronary care unit to be studied. The mean age of the subjects was 53.54 (+/- 7.5) which is a relatively young population. This may have been typical of the patient population admitted to CCU at the time of the study but was not an accurate reflection of the mean patient age now admitted to CCU (67 years). This therefore had to be considered Would an older patient population derive similar benefits? It was to answer these questions the current study was proposed allowing the researcher to establish whether there was a place for PCA in the management of cardiac pain, and if so, would this be more or less effective then current interventions in the management of pain following myocardial infarction.

The primary aim of the work reported in this thesis was to evaluate the effectiveness of PCA as a technique in which the patient has control over their analgesia. The study reported in chapter 4 will compare the administration of opiates using a PCA system to the conventional method of analgesic administration in the Coronary Care Unit i.e. the intravenous injection of diamorphine delivered by bolus dose by the nursing staff.

Prior to commencing this study it is necessary to build on the literature available related to the process of the assessment of cardiac pain within a coronary care unit. There was no empirical evidence of how pain is assessed within the CCU to be studied. There was also no previous information related to the verbal communication which occurs between nurses

and patients who are experiencing pain within a coronary care unit. The studies designed and completed in this thesis will attempt to examine these factors. They will answer the following questions:

1) What is the current procedure for pain assessment in a Coronary Care Unit?

2) What is the duration and frequency of interactions between nurses and patients who have cardiac pain?

3) Do nursing staff ask relevant questions when they assess cardiac pain?

4) Does the frequency, duration and content of verbal nurse-patient interactions alter after an in-service training programme related to pain and its management?

5) Will diamorphine administered via a Patient Controlled Analgesia system compared to conventional IV bolus administration show any difference in the patients pain experience during their stay in CCU?

Chapter 2

Materials and Methods

2.0 Introduction

The following chapter will describe the materials and methods utilised in this study, and the institutional setting in which it took place. Two pilot studies will also be described. The purpose of these studies was to assess the tools which were being developed as measurement instruments.

2.1 Setting

The research took place in Ninewells Hospital and Medical School, Dundee Teaching Hospitals NHS Trust, Scotland. This is a 684 bedded teaching hospital which also has dedicated day case facilities and delivers care to approximately 450,000 patients per annum in Tayside. The Coronary Care Unit (CCU) is a nine bedded unit with individual cubicles and a throughput of approximately 1500 patients per annum. Sixty one percent of the patients admitted are male and 39% female. The mean age of the female population is 69, and the male population is 64.5. Patients with myocardial infarction are most often admitted via the Accident and Emergency (A&E) department where they are assessed by the admitting registrar then referred to the cardiology Senior House Officer (SHO) who is first on call for the unit. They are then transferred to CCU where they are observed and monitored closely by both medical and nursing staff. They generally remain in CCU for 48 hours and are then transferred to a ward in the general medical directorate to continue their recovery prior to their discharge. The allocation of their ward on the general medical directorate is dependant on their day of admission as each unit admits patients in a 24 hour period from 08.00-08.00 hours the following day. All patients will be transferred to this unit unless they have been an in-patient in the previous 12 months. If this is the case they will be transferred back to the ward they were previously in. On average their stay in hospital is between 5-7 days before they are discharged into the community to continue the process of recovery with support from their family and friends.

2.2 Data Collection and Transcription

In order to carry out structured observation of nurse-patient verbal interactions within CCU, a total of nine cassette recorders were used for the collection of data. These were compact stereo cassette player/recorders which had built in microphones. The dimensions were 130mm (height) x 85mm (width) x 33mm (depth) which meant they were small and discrete but still provided adequate quality of recordings. They could be powered by either a mains adapter (3V DC output) or by 2AA batteries. Nine AC adapters were also purchased and used in each room. Each cassette recorder also had batteries in situ in case it was inadvertently disconnected from the wall to prevent loss of verbal interaction data.

Nine C90 cassette tapes either Scotch BX, Low noise normal bias or, Phillips FX 90, normal bias were used in the collection of the pilot study data. A further 30 x C90 cassette tapes were purchased to record nurse patient interactions over the four week period when interactions were recorded before and after a training programme. Measurement of the duration of the nurse patient verbal interactions was done using a stop watch. The data collected throughout the studies were transcribed into a personal computer (PC). This was then analysed to measure the duration and content of the nurse patient verbal interactions. The specific technique will be described in detail in chapter 3, Sections 3.1.2 and 3.2.2.

2.3 Equipment

Seven Graseby Patient Controlled Analgesia Systems (PCAS) were on loan to the unit for the duration of the study. The PCAS machine weighs 2.7 kg is 35.5 cm long, 12.7 cm wide and 8.1 cm deep. It is powered by a 240 or 110 volt mains powers supply and has internal rechargeable batteries which may last up to eight hours. The device may be mounted vertically on an intravenous pole. It is designed to use Becton Dickenson (BD) 50-60 ml syringes. The patient triggers the device by pressing a pneumatic button which may be strapped to the patients hand with a velcro strap. The pump may be used with a Hewlett Packard printer to provide a print out a summary of all demands. The machine is programmed using a set of menus. It may deliver a wide range of drug concentrations from 1 mcg /ml to 99.5 mg /ml. The pump has the facility to deliver a loading dose if desired from 0.1 mcg to 99.5 mg. The bolus dose which will be delivered by patient demand can range from 1 mcg to 99.5 mg. In addition a background infusion ranging from 0-20mls/hour may be delivered if required. The syringe is secured by a locking metal clamp which is locked in place with the key used to access the programming facilities of the pump.

The BD 50-60 ml plastic syringes were used for administration of the diamorphine infusion. The Viggo manometer tubing was connected to the syringe. Each patient had a 'Cardiff Valve' attached to the end of the line. This is a specialised one way valve to prevent back flow of opiate infusion up any other infusion line thus preventing a sudden infusion of opiates into the patient if the rate of any concurrent infusion was increased. The Cardiff Valve was connected to the intravenous cannula (venflon 18FG) which all patient have in situ on admission to CCU.

In the control group analgesic drugs were prepared by the nursing staff using BD 5ml syringes and needles (21 gauge). The drugs are then administered via the intravenous cannula which the patients have in situ.

2.4 Drugs

Pain relief was provided for all patients by the administration of intravenous diamorphine. Diamorphine is one of many hundreds of opiate derivatives which has been synthesised from morphine. Its chemical structure varies from morphine by the presence of two acetyl groups which increase its lipid solubility. Diamorphine is a colourless odourless solid. The freeze dried powder of diamorphine hydrochloride for reconstitution in strengths of 5mg and 30mg was used in the study. It is a very stable substance and this was reflected in the evaluation of a sample stored at ambient temperature for over 25 years was found to be almost pure (Payne and Tempest 1988). The stability of aqueous solutions of diamorphine is less than that of morphine as hydrolysis of the 3-acetyl group occurs both in the dark and in the cold. This therefore makes the storage of solutions of diamorphine impractical and was the reason these drugs were prepared at ward level by the nursing staff immediately prior to their administration. Diamorphine is rapidly metabolised to 6-0-acetyl morphine and then more slowly to morphine. The overall analgesic response is largely determined by the physiochemical and pharmacokinetic properties of these substances. The high lipid solubility of 6-0-acetyl morphine, makes its transfer time over the blood brain barrier rapid. It is then more slowly converted to morphine which is less lipophyllic and therefore cannot easily enter or leave the central nervous system (CNS) (Way et al 1960). The transfer of diamorphine in comparison to morphine was demonstrated by studies which reported that the uptake of radiographically labelled 11C-morphine was evident after 35-45 minutes and the half life was greater than 2 hours (Hartvig et al 1984). In comparison, the 11C-diamorphine level peaked earlier and its half life was considerably shorter. A similar experiment in rats showed the uptake of diamorphine in the brain following single injection into the rat carotid artery was far higher than morphine. The uptake of diamorphine was 68% (+/- 6%) whereas levels of morphine were undetectable (Oldendorf et al, 1972). The increased ability of diamorphine and 6-0-acetyl morphine to penetrate the blood brain barrier may explain the higher potency of diamorphine and its more rapid onset of action in comparison to morphine. Diamorphine hydrochloride for injection was reconstituted with water by the nursing staff to make a concentration of 1 mg/ml. In the PCA group 30 mg of diamorphine in 30 mls of water, for infusion by the Graseby PCAS machine was prepared. For both groups the bolus injection, usually 5mg in 5ml of water was titrated according to patient response. This was given to the PCA group immediately prior to the commencement of PCA to achieve a painfree state and throughout the study period for the control group. The total amount of diamorphine administered to the patient was recorded after 24 and 48 hours by the researcher.

Metoclopramide 10 mg intravenously was given to the patients 8 hourly as required to prevent the nausea and vomiting induced by opiates.

2.5 Development of Measurement Tools

2.5.1 Urinary Catecholamine Collection.

Urinary catecholamines measurements may be used as an index of symaptho-adrenal activity as they are a direct product of the system under investigation and are available for quantification in plasma and urine samples. Their levels will indicate the activity of the sympatho-adrenal system (SAS) at a particular time. Alterations in the plasma catecholamine concentration may provide a good source of information related to SAS activity in relation to an acute event but it gives no indication as to how active the system was in the previous two hours. The urinary catecholamine levels on the other hand will provide an integrated measure of overall activity over the period of interest and they are less sensitive to transient changes in SAS activity. The measurement of noradrenaline and adrenaline may be used as indices of SAS activity as both compounds will reflect glomerular filtration of plasma catecholamines and will increase in times of increased activity of the SAS.

The measurement of urinary samples avoids the peaks seen by the lability of the SAS which are evident in plasma sampling. Within the constraints of the clinical setting it may also be difficult to arrange plasma sampling to coincide with an event which may generate an increase in catecholamine secretion, for example pain, which could occur at anytime throughout the day. In addition organisational constraints within the hospital would not permit a 24 hour laboratory service to prepare and complete the biochemical assay. It was for these reasons it was thought reasonable to measure urinary catecholamines which would provide a picture over a longer time period reflective of the overall pattern of SAS activity throughout the day. Elevated levels of catecholamines in urine as opposed to blood samples make the measurement techniques less invasive and demanding. It must be remembered the interpretation of results can be complicated because of dependency on glomerular filtration rates.

Urine samples were obtained from each patient after they had entered into the study. They were asked to discard the first sample then any urine passed from that time on was collected and placed in dark glass bottles containing 50 mls of 3 molar solution of hydrochloric acid. The patient's name, personal identification number, the date and time of the start and finish of the collection were recorded on the label attached to the neck of the bottle. This was accompanied by a biochemical request form requesting the analysis of urinary catecholamines to a senior biochemist who had agreed to complete the measurement of free circulating adrenaline, noradrenaline and dopamine.

The analysis was performed using the technique developed by Bartlett (1992). The protocol developed for the measurement of urinary catecholamines by High Performance Liquid Chromatography (HPLC) with electrochemical detection is described in Appendix I

2.5.2 Pilot Study of Urinary Catecholamine Measurement

Following the review of the relevant literature and the selection of the research study methods a small pilot study was conducted. This study had three aims:

1) To test and refine data collection methods
2) To identify problems which could affect the conduct of the main study
3) To acquaint nursing staff within CCU, the general medical wards and the laboratories with the study procedure.

The pilot study was completed between the 30th July 1992 and the 9th August 1992 after 10 subjects had been recruited. Patient follow up ended on the 9th August 1992, following the completion of the final urine collection. Measurements were based on the advice of an expert biochemist with a special interest in the measurement of catecholamines. The measurements were made on free circulating dopamine, adrenaline and noradrenaline. The technique for the collection of the urinary catecholamine samples was described and two information sheets produced; one for patients and one for staff (see appendix II and III). Urine was collected for 2 consecutive 24 hour periods while in CCU and for a further 24 hours on the 5th day of their admission in the general medical ward. The two groups of staff who would participate in the collection of the urine samples were seen by the researcher and instructed in the study procedure. A copy of the staff information sheet was available in the unit and on the medical wards for reference. Each member of staff employed in CCU at that time was seen by the researcher and given a copy of the information sheet.

Each Senior Charge Nurse on the medical floor was contacted by letter and a convenient time arranged to meet to request their co-operation in the collection of the urine samples. Meetings occurred on all 6 wards with all available staff at the time. Copies of the protocol were left for reference with a contact number. Each Senior Charge Nurse agreed to inform the remainder of the staff who had not been seen by the researcher. Letters were also sent to all the consultants on the medical floor to inform them of the research study and to ask their permission to continue with the collection of the data while under their care. None of the consultants refused their co-operation.

The pilot study involved the collection of urine samples from 10 patients who had been admitted to CCU with a diagnosis of myocardial infarction. These samples were then

analysed by the biochemist to ascertain whether this method of sampling was suitable for analysis. Measurable levels of each of the three catecholamines were found although levels of adrenaline were found to be much smaller than the other two free circulating catecholamines.

2.5.3 Results of Urinary Catecholamine Measurements in 10 Patients

The results of the total urinary catecholamine secretion are presented below (Table 2.1)

Table 2.1 Mean Total Of Urinary Catecholamine Secretion After 24,48 And 120 Hours Post MI

Catecholamine	Day 1 Mean Total nmol/day (S.D.)	Day 2 Mean Total nmol/day (S.D.)	Day 5 Mean Total nmol/day (S.D.)
Noradrenaline	668 (348)	440 (324)	421 (302)
Adrenaline	64 (97)	33 (57)	5 (16)
Dopamine	1555 (904)	1102 (983)	1342 (712)

Since the total secretion of catecholamines could be affected by urine volumes the mean concentration of each of the free circulating catecholamines was also calculated. The results are presented in Table 2.2

Table 2.2 Mean Concentration Of Urinary Catecholamine Secretion After 24, 48 And 120 Hours Post MI

Catecholamine	Day 1 Mean Concentration nmol/day (SD)	Day 2 Mean Concentration nmol/day (SD)	Day 5 Mean Concentration nmol/day (SD)
Noradrenaline	0.496 (0.523)	0.432 (0.352)	0.3485 (0.286)
Adrenaline	0.0395 (0.049)	0.0179 (0.027)	0.00410 (0.013)
Dopamine	1.131 (0.541)	1.070 (0.830)	1.079 (0.638)

The results from the above two tables can bee seen more clearly in the following graphs Figures 2.1 and 2.2.

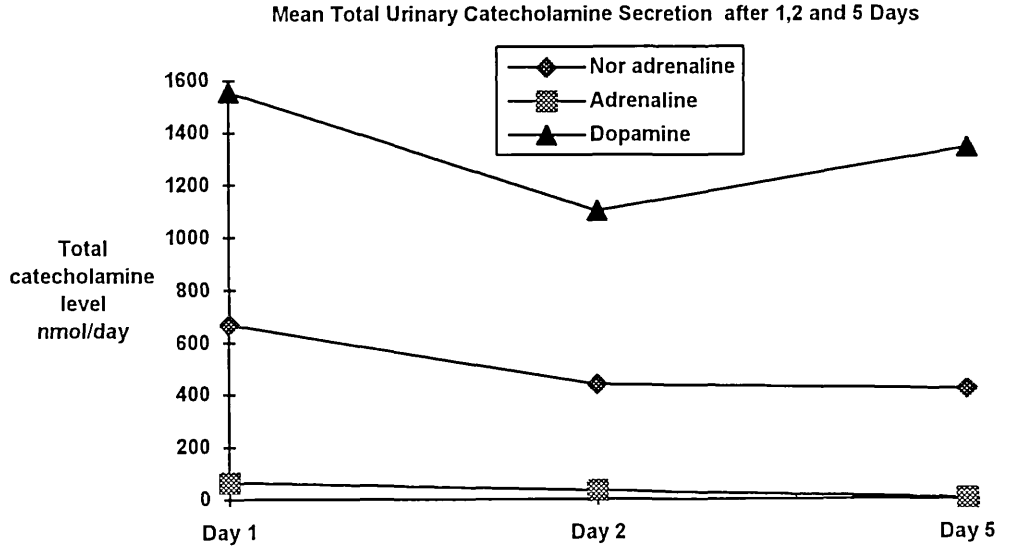


Figure 2.1. Mean Total Catecholamine Levels on Day 1, Day 2 And Day 5.

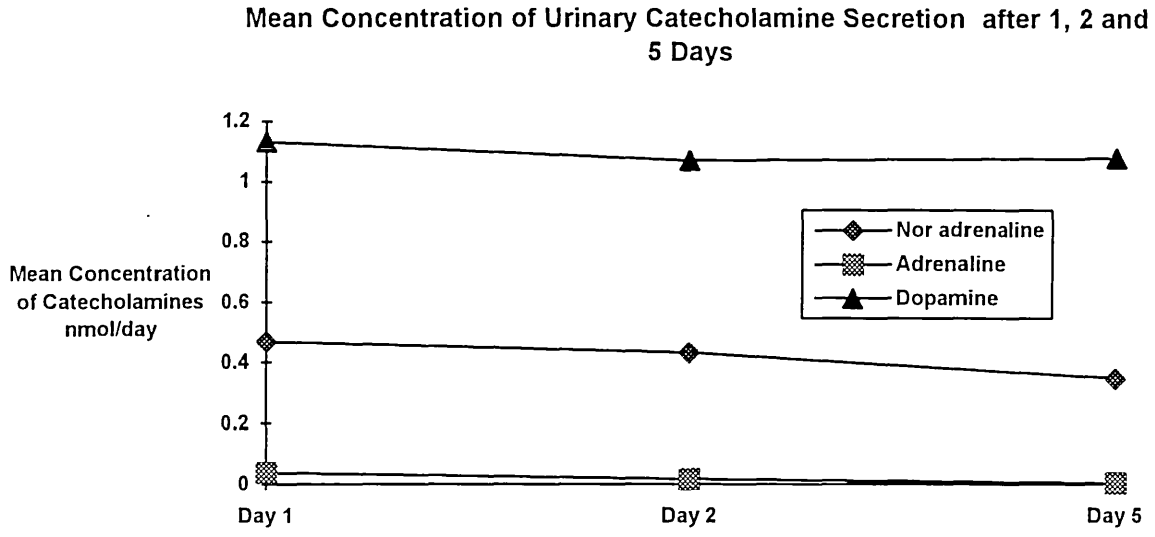


Figure 2.2 Mean Concentration of Catecholamine Levels on Day 1, Day 2 and Day 5.

The completion of this pilot study demonstrated a variable pattern of catecholamine secretion following myocardial infarction. The technique used for analysis was sensitive enough to provide these data. There were insufficient numbers of subjects in the pilot study to complete meaningful statistical analysis. At this point no attempt was made to correlate these results to patients pain experiences as this was purely to test the technique, familiarise staff with the study procedure and eliminate potential problems.

2.5.4 Pain Assessment Tools

A pain assessment chart was developed by the researcher (Appendix IV). The chart used was a modification of the London Hospital Pain Assessment Chart. The front page of the chart allowed the recording of demographic data and the date. The remaining space was to allow an initial assessment of the pain which included the patient's own description of the pain, what helps relieve the pain, what makes the pain worse, whether the patient had pain at night, at rest or on movement.

The intensity of pain was measured using a numerical rating scale. This consists of an 11 point scale with 10 equal divisions ranging from 0-10. In addition it has anchors at each end of 'No pain' and the 'worst possible pain'.

The pain assessment chart also had pictorial representations of the common sites of ischaemic pain from A-H which the patient could select. The chart also had a representation of a total body viewed from the front and the back to allow the identification of pain not necessarily of cardiac origin. In addition the chart included a selection of descriptive terms commonly used to describe cardiac pain. This aimed to help those who found the sensation difficult to describe.

Documentation of the information was also included in the chart to describe the location of pain, the intensity of pain (which was scored first by the nurse and then the patient), the patient's activity at the time of the pain, the analgesia given and its effect. The charts were used in the unit and after three months they were evaluated and modified.

Meetings were arranged with all the staff employed in the unit at this time. The use of the pain charts was discussed and feedback obtained related to the positive and negative aspects of the document. The charts which had been used were kept by the researcher and reviewed to determine how these had been used in the ward. Observation of the charts, feedback and discussion with the staff guided the modification of these charts and resulted in the following changes.

Two tools were developed; the first the pain assessment tool (Appendix V) comprised of a double sided A4 chart . On one side was a large bold numerical rating scale (NRS), and on the other the 8 pictorial representations of the common presentations of ischaemic pain from A-H. Two pictures representing whole bodies were also on the chart to allow the identification of pain in other sites. A list of words commonly used to describe pain and/or discomfort was included on the chart to assist any patient who had difficulty describing pain. The NRS was produced in this manner to make it clear and easy to see. This was important as often patients are admitted as emergencies to CCU therefore may not have brought their spectacles into hospital. The patients might have been given doses of opiates

prior to admission which could impair their ability to read. The production of the large, bold NRS would minimise any problems in interpretation. These ideas were taken to the artist in the medical media department within Ninewells Hospital who produced high quality representations which were made on buff coloured card. These were then placed in plastic folders and one was put in each patient's room where it was kept for the use of the patient and the nursing staff during pain assessment.

A separate sheet was produced for the recording of the assessment. This was produced by the researcher on the computer, printed out using a laser jet printer, then reproduced to produce an A3 sheet for the recording of the patient's pain assessment. This chart was then folded to A4 size. The front page contained the person's demographic details. It also included a list of the factors that staff should consider when they assessed pain. These factors included onset and precipitating factors, location (with radiation), duration, quality, intensity of pain, and aggravating and relieving factors. The date and time of the initial pain assessment were recorded on the front page. On the inside staff recorded the date and the time of the pain assessment, the nurses and the patients score of pain, the patient's activity at the time of the episode of reported pain, any analgesia that was administered and an evaluation of the intervention. This document is shown in Appendix VI.

2.5.5 Questionnaires

Two questionnaires were designed to explore the patient's experience of pain following myocardial infarction. The use of questionnaires to collect data does not allow the respondent to elaborate on the questions nor to ask for clarification of questions. In addition the researcher is unable to use probing techniques to obtain additional information. The advantages of this method of data collection is that the questions are presented in a consistent manner and there is less opportunity for bias than using an interview technique. In developing the questionnaire it was first necessary to identify the information desired. This was done by identifying specific information the researcher wanted related to the patient's pain experience. The researcher then reviewed the literature to find similar questionnaires which had been used in the evaluation of patient's pain experiences in other clinical settings. There was no existing questionnaire which could be used in this research study, therefore two specific tools for this study were developed. When designing this questionnaire, it was important to pitch this at the educational level of potential subjects. The length was kept as short as possible to encourage compliance in completion of this instrument. The initial development went through several stages. The researcher identified the information she wished to obtain related to the patient's experience of pain in CCU. The instrument for the measurement of this information was developed following the process of classical test theory (Burns and Grove 1993). The first step was to define the concept and the more clearly defined this was, the easier it was to write items to measure it. The design of the scale allows the choice of items to reflect the concept as fully as possible.

Each item needs to be clearly and concisely stated and to express only one idea. The reading level of items needs to be considered in terms of potential respondents. It was also important to seek item review by a qualified individual. The researcher consulted a post doctoral lecturer at Dundee University, with a special interest in questionnaire design. Feedback was obtained related to accuracy, appropriateness and relevance to test specifications, construction flaws, grammar, offensiveness, appearance of bias and readability. Several items were amended on the basis of this critical feedback.

At the beginning of the questionnaire the subjects were given instructions in how to complete it. The instructions were reinforced by the researcher when they were given to the patient prior to their completion. The questionnaire contained a mixture of both closed and open-ended questions. The former questions have a response set which includes a specific list of alternatives from which the subject can select for example;

Prior to your admission did you ever suffer from angina

yes ☐
no ☐
don't know ☐

The response sets also had to be mutually exclusive e.g.

Before you came into CCU how long did your chest pain last before you contacted a Doctor?

less than one hour ☐
more than one hour but less than 2 hours ☐
more than 2 hours but less than 4 hours ☐
more than 4 hours but less than 6 hours ☐
more than 6 hours ☐
I was not admitted with chest pain ☐

The arrangement of the responses vertically reduced the likelihood of errors in responses.
The researcher then tested the items on an limited number of subjects who were representative of the target population. This involved 5 patients who were in CCU at the time. They were given the questionnaire on the day of their discharge from CCU (on day 3) and then the researcher arranged a mutually convenient time to collect the questionnaire, discuss each item and response with the subjects. They were asked to comment on any problems and to make suggestions for improvement of the questionnaire. This pilot study was performed to test the clarity of the questions, completeness of response sets, the time required to complete the questionnaire and the suitability of this method of data collection.

Several items were not answered appropriately and there was ambiguity in the questions. The ambiguous items were amended.

Following the alteration to the tool it was again piloted on a small sample of patients in the same manner as previously described. This led to the development of the final instruments which were used in the data collection in the comparative study of patients who received diamorphine either following administration by the nurse, or self administration by the patient using PCA which will be described in Chapter 4.

These stages of development resulted in the production of two instruments; the first a 34 item questionnaire (Appendix VII) which was given to the subjects in the control group and the second a 40 item questionnaire (Appendix VIII) which was given to the experimental group. Both questionnaires were distributed with a cover letter which explained the purpose of the study. The last page also included the return name and address. Questions 1-19 were common to both groups after which the questions diverged but were designed to allow comparison of the answers. In the PCA group the questionnaire items 34-40 were specifically related to the use of PCA.

The initial section of the questionnaire related to information prior to their admission. For example, the patients were asked if they ever suffered from angina to assess whether they had pre-existing knowledge of their cardiac condition as this may have influenced their behaviour or pain experiences. The duration of pain the patient endured before contacting a doctor was determined. This was to allow comparison with other studies and to determine whether the patients sought help early enough to receive thrombolytic therapy to limit myocardial damage. The nature of the pain, the intensity of pain, whether analgesia had been administered before the patient arrived at the hospital and the effectiveness of this were assessed. Patients were asked to recall the intensity of their pain on arrival to hospital, as a comparison with their pre hospital experience. Following admission they were asked whether the cause of the pain was explained to them, what they were told, were they told to report any pain/discomfort. The amount and nature of pain that they experienced was also addressed. They were asked about their ability to describe the pain. It was also attempted to determine their behaviour; for example how soon they had reported pain to staff, whether they would request medication, what their expectations of pain relief and actual experiences were. An attempt was also made to measure the patients' satisfaction with their pain management . The PCA group were also asked questions specifically related to their experience and opinions of PCA. All patients were encouraged to comment about their experience in CCU and the management of pain.

The researcher collected the completed questionnaires in person to prevent loss of data. Each questionnaire was then checked for completeness and the opportunity given to patients to discuss any other aspects of their experience.

2.6 Statistical Analysis

The results presented in this thesis were analysed using a variety of statistical tests which were selected following consultation with a statistician, and the review of statistical textbooks (Monk, 1991, Robson 1983, Kirkwood 1988). The first step in analysis is to summarise the data and observe frequency distributions. Examination of the data revealed two distributions; either the data followed a normal distribution pattern or they were characterised by skewed distributions. In the cases where the data were reasonably normally distributed a parametric test was used, otherwise an appropriate non parametric test was used for data analysis.

Parametric tests allow the analysis of numerical data making the assumption the frequency distribution of the population sampled follows the curve of a normal distribution or Gaussian Distribution which is symmetrical about the mean and bell shaped. The standard deviation is associated with the curve in the following way. An upper limit and lower limit of values can be obtained by going one standard deviation above and below the mean respectively. The proportion of the population which will be contained within these limits will equal 0.6826 or 68.26%.

Nonparametric methods are an alternative set of techniques for analysing numerical data which make no assumptions about the underlying distribution of the data. They are particularly useful when there is obvious non normality in a small data set which cannot be corrected by a suitable transformation.
The statistical tests used included Wilcoxon analysis, Mann Whitney, chi square, one way analysis of variance (ANOVA), analysis of covariance, the t test and the sign test. Minitab was the statistical package used for the analysis of all data in the research study. The significance level of 5% which is the standard criterion widely accepted in psychological and clinical research was set for the interpretation of the data in this research.

CHAPTER 3

Nurse Patient Communication With Patients Suffering From Cardiac Pain: Does Training Affect Behaviour?

3.0 INTRODUCTION

Coronary heart disease has become a major cause of morbidity and mortality in the Western Countries (Jowett and Thompson, 1989). Approximately one third of the patients who are admitted to the Coronary Care Unit (CCU) within Ninewells Hospital, Dundee, have suffered an acute Myocardial Infarction (MI) and may therefore have suffered severe chest pain as a manifestation of acute myocardial ischaemia due to atheromatous obstruction of the coronary arteries (Davies, 1987).

3.0.1 The Current Status and Inadequacies in Pain Management

The sudden onset of acute chest pain is a warning that something is wrong and is often the reason why people will seek medical assistance (Bonica, 1987). Prompt relief of pain is essential not only for humanitarian reasons but also since persistent unrelieved pain can initiate pathophysiological effects causing catecholamine release and an increased workload on an already compromised myocardium. Patients also experience intense fear and anxiety which exacerbates the hypothalamic stress response resulting in increased blood viscosity, fibrin deposition and platelet aggregation which may further reduce blood flow and oxygen supply to the myocardium (Bonica, 1987).

Reports in the literature have demonstrated that pain control following myocardial infarction is often inadequate as many patients continue to experience pain (Hayes et al 1979, Scott and Orr, 1989, Toft & Jorgensen 1987, Townsend, 1988; Willetts, 1989). Direct observation of cardiac patients as a nurse employed within a Coronary Care Unit supported this evidence as patients who although appearing to be comfortable often reported they had experienced continuing pain which had not been adequately treated. The under management of pain is not unique to cardiac patients and has been widely reported in other clinical areas. (Marks et al., 1973; McCaffery, 1983). The research and investigation of pain has served to highlight the multi-faceted complexity of the problem and the difficulties in its management (Bonica, 1987).

The experience of pain encompasses both physical and psychological components each of which must be considered if effective pain control is to be provided (Soafer, 1984). The sensation and perception of pain are unique to the individual and should be managed as such. The widespread belief that pain is always the result of physical damage and the intensity of pain felt is proportional to the severity of the injury still exists (Melzack et al., 1988). There are however instances when this relationship fails to hold up as is demonstrated by the experience of a patient with a "Silent MI" i.e. who has suffered no pain (Airashanan and Koshken 1992, Droste et al., 1986, Kurita et al.) and conversely by the

experience of those who have suffered severe pain yet demonstrate no abnormalities in their coronary arteries (Proacci et al., 1976). Similarly Hampton (1977) demonstrated a poor correlation between muscle damage and pain sensation. There are a number of factors which can contribute to the mismanagement of pain, however the present discussion will be confined to the factors determined as important in the area of acute pain management; the attitudes and knowledge of staff, and the influence of communication skills.

3.0.2 Attitudes and Knowledge of Staff Which May Impair Pain Management.

The complexity of pain perception and difficulty in objective assessment has been recognised by researchers (Woodforde and Merksey al., 1972; Beswick, 1987; Donovan, 1983; McCaffery, 1983; Donovan et al., 1987) In order to treat pain adequately it is necessary to make a systematic assessment of the patient's pain. Due to their 24 hour contact with the patient nursing staff are in an ideal position to make this assessment but this is still a problematic area. Difficulties in assessment and subsequent management can arise when nursing staff rely on their own judgements as to how much pain the patient is experiencing (Heindrich and Perry, 1982; Seers and Goodman, 1987). Often patient and staff perceptions of pain are at variance (O'Conner 1995, Seers, 1989) and inferences are influenced by culture and religion (Davitz and Davitz., 1980).

It has been suggested the aim of therapy should be to obtain complete relief (Weis, 1983) but clinicians and patients opinions may vary as to what complete relief is. It has been suggested that total pain relief is not a goal amongst nurses (Cohen, 1980). This was shown in the survey when nurses were asked what their objectives were in the administration of analgesia in the first 48 hours after surgery. This revealed only 3.3% of staff aimed to achieve complete relief, 57.5% to achieve as much relief as possible, 38.3% to reach a level allowing the patients to function and 0.8% to reach a level the patient could just tolerate.

For 98 patients asked to consider the same objective 29% wanted complete relief, 47% as much as possible, 18% enough relief to allow them to function and 6% to a level they could tolerate. Similar information was obtained in a study which asked nurses, doctors and patients how effective pain relief should be (Kuhn et al., 1990). Fifty percent of the nurses reported complete relief was their aim, 48% wanted the patient to be comfortable and 2% to take the edge off the patient's pain. The responses of medical staff revealed 53% wanted complete pain relief, and 47% wanted effective relief. Of 101 patients, 36% wanted complete relief, 58% wanted to be comfortable and 5% to take the edge off their pain. If complete relief is not the aim of the health care professionals caring for patients in pain then it is unlikely it will be possible for patients to achieve a painfree state. The diversity of aims amongst staff and patients in the control of pain may contribute to the inadequate

management of pain and is exacerbated by the fact that severe pain is still reported in many clinical settings. Owen (1990) also reported that more than half of 359 patients assessed for 72 hours had pain for almost all of that time.

The continuing high prevalence of pain in hospitalised patients was reported in a retrospective review of patients' medical records (Gu and Belgrade 1993). This showed 70% experienced pain on presentation and/or during hospitalisation and that pain was the primary complaint of more than a third of these patients. Cardiac pain was reported to be the second most common cause of pain. The persistence of such reports in the literature suggest that pain relief is still inadequate. This suggests a comment made 20 years ago in an editorial in the Lancet (1976) which stated it is '*an indictment of modern medicine that such an apparently simple problem as the relief of post operative pain remains unsolved*' is still relevant and may equally be applied to acute pain associated with other medical conditions.

A variety of factors have been implicated in the under management of pain and within the current climate to provide high quality care it is essential to question practice and consider why pain management is not always effective (Smith and Utting, 1976). One suggestion has been the knowledge of staff in relation to mechanisms and pharmacological properties of analgesic therapy is a contributing factor to poor pain management in clinical practice (Marks and Sacher, 1973; Seers, 1987, White, 1985). More recently studies have indicated that nurses lacked knowledge and understanding of basic pain management principles, opioid use and mechanisms of acute and chronic pain (Brunier et al. 1995).This may result in inappropriate prescription and use of analgesics. Previous studies have shown that doctors can underestimate effective dosage, over estimate the duration of action and have exaggerated opinions of the danger of addiction (Ferrell et al., 1992, Marks and Sacher, 1973) thus resulting in ineffective use of narcotics in pain management (Brockopp et al., 1993). It has also been suggested that even when the knowledge is available it may not be applied in practice (McCaffery 1992).

Pain management may be impaired by the fact that it is a subjective experience and the perception of pain is unique to the individual. In addition each person demonstrates tolerance to pain which manifests itself in the duration and intensity of pain he/she is willing to endure. This response also alters from one person to another and may vary with time. The patient's own goals or beliefs of what others value may affect his pain tolerance and should be respected by carers. The first essential prerequisite in caring for a patient who is in pain is to believe the patient when they state they have pain. Health care workers should be alert to the fact that not all patients however report pain and denial is not

uncommon. This therefore adds to the importance of implementing strategies to effectively assess pain and encourage communication between patients and nurses.

3.0.3 Communication Skills and Their Influence on Pain.

During the assessment of pain, prior to any intervention to alleviate the patient's pain a variety of behavioural and cognitive processes occur between the patient and the nurse during a nurse-patient interaction. This process can be demonstrated by the model of Nurse Controlled Analgesia (NCA) shown in figure 1.4. This model was developed at an early stage in the research to assist in defining the problems to be addressed. This was discussed previously in chapter 1, section 1.13.

The nurse may obtain information from the patient about his/her pain by questioning and observing the patient. The nurse then makes an inference about the patient's pain state which may influence her decision about treatment. If the nurse decides that the pain is above a tolerable level she can make a rational choice of the most appropriate therapeutic agent. She may also carry out other actions to assist in the assessment of the patient's pain e.g. record an ECG, or use a pain assessment tool. Having made an assessment and planned her nursing intervention the nurse should document this action and evaluate its effects.

By highlighting the links in this complex chain of nurse-patient interaction it was apparent that it should be possible to measure activities occurring at certain stages of this interaction. Within the nurse patient interaction two main factors which could impair pain management were highlighted. The nurse, dependent on her communication and assessment skills could fail to gather adequate information and/or could misinterpret the information she acquired. The patient could also influence his/her pain management as often he/she will deny "pain". The nurse and patient could independently influence pain management and inadequate input from both parties would have detrimental results.

At the time of designing this study there was very little literature available as to how nurses communicated with patients in CCU. One study in the USA related to communication in CCU which showed nurses only spent about 1% of their time talking to patients (Ley, 1977). The study by Ashworth (1980) in the UK related to communication with patients in ICU involved interviewing the nursing staff. This provided indirect information related to staff communication in CCU as many of the nurses had also worked in CCU. Sixteen of 112 nurse said they would talk less to those who needed to rest especially the patients with coronary disease (Ashworth, 1984). Since limited information was available related to how well pain is assessed in Coronary Care Units, the researcher wanted to obtain accurate information related to the verbal communication which occurred between nurses and patients who experienced pain and thus contribute to meeting this deficit. A study was therefore designed to observe and measure nurses' behaviour while interacting with patients in CCU; the researchers particular interest was to determine how nurses communicated

with patients who were in pain. This led to the planning and completion of a pilot study to gather data related to nurse patient communication in a Coronary Care Unit.

Communication forms the foundation of all nursing care yet it is an area of nursing which has been taken for granted or underestimated (Macleod Clark, 1982). From the time of the initial contact with the patient the nurse will begin to seek information related to the patient's behaviour, his perception of his health state and his nursing care needs in order to formulate a plan of care. Within the literature the benefits of nurse patient communication have been clearly demonstrated (Macleod Clark, 1982; Ashworth, 1980) but analysis of real life nurse patient communication shows that communication is poor. There are specific verbal communication skills needed by staff who should be able to initiate, maintain, direct and terminate verbal interaction with patients. The skills of the staff therefore will have an important role in the maintenance and/or breakdown of a conversation. If the nurse uses verbal communication which supports, encourages and praises what the patient says it could have the effect of directing the patient's conversation to the important or relevant topics. The use of closed questions may be useful to collect facts quickly but if this technique is used habitually it can have an inhibiting effect on the development of an interaction (Ivey and Authier, 1978).

The nurse patient interaction can be influenced by skilled use of verbal techniques and improve the ability of the nurse to gain information from the patient to find out how they feel. There is also considerable evidence from the fields of teaching (Jensen et al., 1978), counselling (Moreland et al., 1973) and social work (Ellis, 1980) which support the proposition that these behaviours can be learned and modified.

It is possible that failure to communicate and provide adequate psychological care may be a function of lack of experience and training as well as or instead of lack of time, however research has shown that communication does not increase when staff have more time (Faulkner, 1980, Stockwell, 1972).

Moss and Meyer (1966) examined the extent to which nursing interactions had an effect on patients pain. They suggested pain relief was dependant on the interaction and exchange of responses between a nurse and a patient. In particular this related to how the nurse initiated the interaction and engaged the patient in decision making behaviour. Pain relief was reported to be significantly better in the group involved in the decision making process despite there being an increased number of patients within this group described as being 'nervous'. The existence of anxiety may have suggested this group would in fact be more likely to have experienced more pain.

The problems in the past may have related to the fact that nurses received very little teaching related to skills in communication. They learnt how to deal with patients by watching other more experienced nurses. These findings suggest that it may be beneficial to investigate the effects of specific communication skills, teaching programmes or types of role model upon the pattern of nurses patient communication in a specific context (e.g. CCU). It has been suggested by these studies that issues of how nurses interact with patients may be important. It may be useful to determine who guides the interaction and which words and phrases are used to stimulate or provoke the interaction although this was not specifically observed in this research study .

Previous studies to assess this information have utilised a technique known as process recording. This provides a detailed reconstruction of what is happening in the interpersonal relationship between the nurse and the patient. Larkin and Backer (1977) stated that process recordings were written descriptions by the practitioner of the verbal and non-verbal responses of the nurse and client occurring during the interaction. It was also stressed that the recording should be a written record of the exact conversation between the nurse and the patient during their time together (Coffey, 1975). The actual words "Process recording" imply recordings written, audio or audio-visual of the nurse client interaction (Sundeen 1981). The main purpose of process recording is to assist the nurse to assess the process of communication occurring in the interpersonal relationship. Better understanding of the communication and interaction patterns can then be used to provide therapeutic care. Previously within this technique information was obtained related to both the verbal and non-verbal behaviours of the client as well as the individual thoughts and feelings of the nurse at the time.

An adaptation of process recording was used in this study which allowed the researcher to assess the process of communication and provided the opportunity to analyse the recording between the nurse and the patient in a controlled environment. It allowed the researcher to compile valuable information in a detailed and systematic manner. The information gathered was only related to verbal communication between the nurse and the patient. No measures were made of non verbal behaviour and/or the thoughts and feelings of the nurse at this time.

A small pilot study was carried out which formed the basis for a later investigation into nurse patient communication with cardiac patients who are in pain. The pilot study will now be discussed in more detail.

3.1 Pilot Study: Observation Of Nurse Patient Interactions Over A 24 Hour Period

3.1.1 Introduction

Pain assessment is a vital part of pain management which requires active effort on the part of the nurse and must begin with the recognition that pain is a subjective experience (Soafer, 1984). The completion of research within the clinical area is often fraught with difficulties and practical limitations. Apart from the ethical constraints these include the shift systems, the wide variety of people who interact with patients and the variety of reactions and behaviour seen in subjects (Thomas, 1991). It is also possible that the clinical staff's goals may be different from those of the experimenter. It is impossible to study pain following myocardial infarction in a laboratory setting, therefore it was intended to introduce the necessary control within the ward environment. The primary objective of the pilot study was therefore to assess the feasibility of doing this. The completion of a pilot study would address four issues. Firstly it would see the study runs smoothly. Secondly, it would test the suitability of a method of collecting data related to nurse patient interactions with particular reference to those related to pain. Thirdly it would foster the co-operation of all staff who would be involved in the study and fourthly it would identify any consistency between this and previous research.

In order to examine pain assessment in CCU a method of measuring the activity of the nursing staff when interacting with patients in pain was designed. Since the onset and occurrence of pain does not take place at specific times of the day, this information had to be representative of the activities which occurred over a 24 hour period.

Before designing the study three alternative approaches were considered. These included the use of questionnaires to examine staff behaviour, but as Simon (1969) observed questionnaire responses may not reflect behaviour. People often do not express their true reactions to the questions i.e. what the person says they do and what they actually do are different and responses can vary from one occasion to another (Treece and Treece, 1993). This was supported by the results of a larger study of nurse patient interactions in CCU which will be discussed in more detail in section 3.2.4. The second approach of non-participant observation was considered but rejected as too much data could be lost. As a senior nurse within this unit, it would be impossible to be free of all clinical commitment to carry out observations of staff behaviour. In addition since more than one patient could have pain at one time it would be impossible to observe each pain interaction. The third option of intermittent sampling of activity e.g. for 10 minutes in every hour was also considered but not used as it only took account of the activity ongoing at this time. The

unpredictability of the patient's pain experience meant it was possible all patients would be pain free at the sampling time but may have had several experiences of pain at other times. This would have resulted in inadequate information being collected which could incorrectly reflect the nature and number of pain interactions between patients and the nursing staff.

The method chosen involved the use of tape recorders which helped to create an overall picture of activities. In addition all activities were recorded at the time of their occurrence thus eliminating the bias of partial or selective recall. The utilisation of tape recorders would capture every detail which was then available for later replay and interpretation. An additional advantage was that the observer could remain outwith the observed interaction thus not interrupting the exchange (Faulkner, 1979).

3.1.2 Method

This was a quasi-experimental study. Quasi-experimental designs were first described by Campbell and Stanley (1963). These designs allow the search for knowledge and examination of causality in a situation in which complete control is not possible. This allowed the conduct of the study within the confines of a working Coronary Care Unit where it would be impossible to exert the controls required in laboratory type experimental design. It is acknowledged this may pose a threat to the validity of the results as it may be difficult to control variance. The value of completing this study in this manner should be acknowledged as this will allow the application of any findings to the clinical situation. This design was selected to offer the greatest amount of control possible within the study situation.

3.1.2.1 Participants

The data collection required the co-operation of two groups of participants; the nursing staff and the patients.

The Nursing Staff

The ward staff included both registered nurses, enrolled nurses, student nurses and nursing assistants. All staff in the unit who were on duty were approached and given an explanation of the planned 24 hour study i.e. to record all nurse patient interactions over a 24 hour period. This study involved 7 staff who were on duty over a 24 hour period from 13.00 hours to 13.00 hours the following day in December 1991. This time period was chosen as

the staff worked a three shift system from 07.30 - 16.00, 12.45-21.30 and 21.00-07.45 hours. On day duty there were usually 5 staff and on night duty there were 2 trained staff and one nursing assistant. Student nurses, who worked in CCU were supernumerary in the clinical area. The staff involved are shown on the table below.

Table 3.1 Employment Profile of the Nursing Staff in the Pilot Study

Staff Grade	Day/Night Duty	Experience in CCU (yrs)
Charge Nurse	Day	4
Senior Staff Nurse	Night	6
Staff Nurse	Day	0.5
" "	Day	1
Enrolled Nurse	Night	4
"	Day	1
Nursing Assistant	Day	1
" "	Night	14

The researcher's interactions were also included in the analysis as the purpose of gathering this data was to test the suitability of the method therefore involvement at this stage was not critical. In addition the researcher was the only nurse on duty from 13.00-21.30 hours, then from 07.30-13.00 hours the following day who could administer intravenous analgesia. Removal of this data would have resulted in no information being available about ongoing communication during analgesic administration. This role was assumed on night duty by the senior staff nurse.

The Patients

The co-operation of three in-patients within the unit was requested. There were 2 male and one female patient aged 57,66 and 77 respectively. All three patients had a diagnosis of myocardial infarction. The aim of the study was explained i.e. to gather information related

to communication between nurses and patients and their consent to record all interactions was obtained (Appendix IX). The patient's right to withdraw from the study at any time without prejudice to their care was enforced. All three patients agreed to participate in the study and remained in the unit for the 24 hour period.

3.1.2.2 Materials:

Three tape recorders were used, one was placed in each of the patient's rooms. Beside each tape recorder was a recording sheet for documentation of the date, time, tape counter number and signature of the nurse involved in the interaction. Spare tapes were available in each room.

3.1.2.3 Procedure:

Within CCU all patients are in individual rooms. The tape recorders were switched on each time the nurse entered the room and switched off immediately before she left the room. The date, time of the interaction and tape counter number were recorded for each interaction. This made it easier to trace the interaction when replaying the tapes. A total of nine C90 tapes were used over this 24 hour period.

The information recorded was replayed on a personal stereo recorder. Each nurse was identified by the researcher by voice recognition and a number allocated to her. Each nurse-patient interaction was timed using a stop watch. Within an interaction a speech segment was defined as the period of time either the nurse or the patient spoke. Responses of acknowledgement to what was being said by the main speaker such as "aha" were ignored. The individual speech segments of the nurse in the interaction were timed and the percentage of time the nurse spoke in the interaction was calculated. The measurements were then recorded to calculate the total spoken time of each nurse-patient interaction, the total spoken time of the nurses, the total spoken time of the patients and the percentage of the interaction which was dominated by the nurse. The frequency of the individual speech segments of the nurse in each interaction was also measured. The same measures were also made for each patient. The interactions were further analysed to give the total time each nurse spent with each patient. The median values were presented in the results to account for the skewed distribution of the data and the influence of any outlying values.

3.1.3 Results

The interactions were replayed for each of the 3 patients. A total of 70 nurse patient interactions were recorded and analysed.
Patient 1

Patient 1 had 19 different interactions with 5 nurses related to pain (Appendix X). Total nurse patient interaction times varied from 4 to 152 seconds (median interaction time was 35 seconds). The total time of the nurses' spoken interactions was between 3 and 125 seconds (median was 32 seconds). The patients' total spoken interaction times varied between 1 and 28 seconds (median 6.3 seconds). The percentage of the interaction dominated by the nurse was calculated by dividing the total time of the nurses interaction into the total interaction time of the nurse and the patient. This ranged between 73 and 100% (median 82%).

The number of speech segments within each interaction was calculated and described as the frequency. This varied between 1 and 6 (median 3) for nurses. The total time each nurse spent interacting with this patient is presented on table 3.4. This ranged from 12 to 555 seconds (median 22 seconds) showing great variability in the nurses' behaviour.

The following table (3.2) shows the data from patient 1. This provides an example of the data collected throughout the pilot study. More specifically it shows the spoken time during each interaction with patient 1 over 24 hours, number of speech segments within each verbal interaction and the percentage of time that the nurse dominated the interaction. Similar data sets were obtained for each patient and used in the subsequent analysis. (Interaction times are expressed in seconds). The median values of the number of speech segments within each interaction were calculated.

Interaction number	Interaction Time Nurse (Secs)	Interaction Time Patient (Secs)	Total Interaction Time (Secs)	Nurse speech segments	Patient speech segments	% Interaction dominated by the nurse
1	6	2	8	2	1	79
2	5	3	8	2	1	64
3	45	9	54	3	3	84
4	25	6	31	5	3	80
5	39	1	40	2	1	97
6	125	27	152	5	5	82
7	21	2	23	3	1	93
8	89	17	107	3	3	84
9	70	5	75	6	4	93
10	0	14	14	0	1	0
11	86	28	114	6	5	75
12	54	17	72	6	6	76
13	5	31	36	3	3	14
14	112	7	119	5	3	94
15	3	1	4	1	2	75
16	22	8	30	4	3	74
17	23	5	27	3	4	83
18	23	2	25	2	2	92
19	32	11	43	5	5	74
Median Values	26	7.5	31	3	3	81%

Table 3.2 Summary of Nurses Interactions with Patient 1 over 24 hours

Patient 2

Patient 2 had 42 interactions with 5 nursing staff. The total duration of each interaction was between 3 and 581 seconds (median 53 secs). The maximum time the nurse spoke was 495 seconds (median 35 secs). The maximum time the patient spoke was 156 seconds (median 25 secs). The nurse spoke up to 25 times in each interaction (median 4). The patient also spoke up to 23 times (median 4). The nurses dominated the interactions 59.5% of the time (See Appendix X).

Patient 3

This patient had a total of 9 interactions with 5 nursing staff over 24 hours (See Appendix X). The total duration of each interaction was between 6 and 104 secs (median 29 secs). The maximum time the nurse spoke was 55 seconds (median 15 secs). The maximum time the patient spoke was 66 seconds (median 12 secs). The nurse dominated the interactions 37% of the times. The nurse spoke between up to 8 times in each interaction (median 5) and the patients between 1 and 8 times (median 4).

In summary, the median nurse spoken time, median patient spoken time (expressed in seconds), as well as the median number of speech segments within an interaction for the nurses and the patients and the percentage of time the nurse dominated the interaction with all three patients are presented in Table 3.3. This demonstrates the variability in interactions which occur amongst nurses and patients. Tables 3.4-3.6 break this information down to highlight the individual differences in nurses and patients related to these same measures.

Patient No.	No of Interactions (all nurses)	Median Total Duration in seconds	Median Total Spoken Time Nurse in seconds (range)	Median Total Spoken Time Patient in seconds (range)	Median No of Speech Segments Nurse (range)	Median No Speech Segments Patient (range)	% Spoken Time Dominated By Nurse
1	19	31	32 (3-125)	6 (1 -31)	3 (1-5)	3 (0-6)	82
2	42	53	35 (0-495)	25 (0-156)	4 (0-25)	4 (1-23)	59.5
3	9	29.0	15 (3-55)	12 (1-66)	5 (0-8)	4 (1-8)	37

Table 3.3 Summary of Nurse Patient Interactions With Patients in Pain Over 24 Hours

Table 3.4 Total Time Nurse Spoke With Each Patient in Pain Over 24 Hours

Nurse No	Total Nurse Spoken time (secs) with Patient 1	Total Nurse Spoken Time (secs) with Patient 2	Total Nurse Spoken Time (secs) with Patient 3
1	12	0	0
2	555	929	43
3	137	0	0
4	23	1061	21
5	89	26	19
6	0	568	58
7	0	0	15

Table 3.5 Median Time Each Nurse Spoke With Each Patient in Pain Over 24 Hours

Nurse No	Median spoken time (secs) with Patient 1	Median spoken time (secs) with Patient 2	Median spoken Time (secs) with Patient 3
1	6.0	0.0	0.0
2	50.0	27.65	33.51
3	22.0	0.0	0.0
4	23.0	74.61	38.88
5	32.0	26.00	110.29
6	0.0	30.48	9.72
7	0.0	0.0	11.99

Table 3.6 Number of Interactions With Each Patient During Pain

Nurse No	Patient 1 Number of interactions	Patient 2 Number of interactions	Patient 3 Number of interactions	Total Interactions with patients
1	1	0	1	3
2	10	20	2	32
3	3	0	0	3
4	1	7	2	10
5	3	1	0	4
6	0	14	3	17
7	0	0	1	1
Total Interactions all nurses	19	42	9	

This information is also presented in the following graph (Figure 3.1)

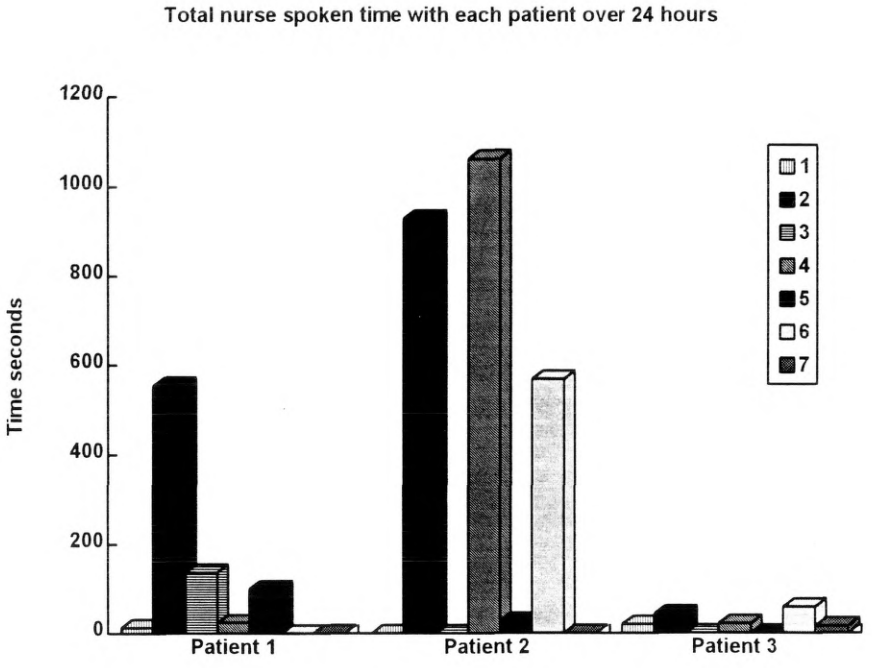


Figure 3.1 Total Time Each Nurse Spoke To Each Patient In Pain.

This clearly shows patient 2 had the greatest number of interactions with nursing staff. Nurse number 2 interacted most frequently with patients.

The final table (3.7) presented demonstrates the duration of the tape recordings obtained recording all nurse patient interactions over 24 hours.

Table 3.7 Total Time of Nurse Patient Interactions Recorded Over 24 Hours

Patient Number	Total time recorded over 24 hours (minutes)	Total Time of Nurse/Patient Interactions (minutes)	Total time of pain interactions (minutes)	% of interaction time related to pain
1	148	113	13min 35sec	11.5
2	145	145	41min 33sec	30.0
3	135	118	2min 21sec	2.0

The variations in the total time recorded and the total time of the nurse patient interactions can be explained by the fact on several occasions the tape recorders were left running after the nurses had left the room. It can also clearly be seen of the total interaction time recorded only a small proportion of this time was related to conversations about pain.

3.1.4 DISCUSSION

The completion of this study confirmed this was a suitable technique for the collection of data related to nurse patient interactions while patients are in pain. This also highlighted a number of findings related to verbal communication occurring between patients and staff at this time.

Interaction times with patients are extremely short. This confirms results obtained by (Cormack, 1976) who found that 86% of nurse patient interactions lasted less than 4 minutes with an average interaction time of 2.3 minutes. Similar results from Bond (1978) demonstrated 55% of interactions between nurses and patients on a radiotherapy unit lasted less than 3 minutes. Faulkner (1980) found nurse patient interactions on general medical wards lasted on average 2-3 minutes and Macleod Clark (1982) reported found the average verbal communication time on the surgical wards was between 1 and 7 minutes. In the present study the nurses also tended to dominate the interaction i.e. they spoke for the longest period of time and more often within the interaction.

By extracting the data related to pain from all the recordings made and assuming the amount of pain experienced related to the time spent discussing this, it can be seen the amount and frequency of pain experienced by a patient following myocardial infarction is extremely variable. When the proportion of interactions related to pain as a percentage of the total recordings of nurse patient interactions made for each patient was calculated this was 12%, 30% and 2% for patients 1, 2 and 3 respectively.

This study showed the wide variability in the number of interactions between different nurses and the patients (Table 3.6). The frequency of interactions will of course be partly affected by the patient's pain experience. It is obvious there will be no recorded interactions if the patient has experienced no pain and conversely the number of interactions was greater with the patient who suffered the most pain i.e. patient number 2. The collection of these data confirmed the haphazard approach to pain assessment and management which existed in the unit. The pilot study had revealed no systematic method of pain assessment was utilised in the unit. The review of the recorded interactions showed at this time no tool was used for pain assessment. The patients were not asked to score their pain and no documentation apart from the nursing kardex was used to describe their pain experience. The entries within the kardex at this time provided minimal information, for example "patient complained of chest pain, GTN x 2 puffs given with good effect". Or "patient complained of chest pain, unrelieved by GTN. I.V. Diamorphine 5mg given with good effect." These descriptions of events were typical examples which provided minimal information of the patient's pain experience. There was no information available on the

location, intensity, quality, or pattern of pain nor any aggravating and relieving factors which could help in the assessment of pain and thus direct the judgements made by staff to improve it's future management. This suggested the assessment and documentation of pain could be improved within the unit. Similar methods of recording pain in nursing documentation were reported by O'Conner (1995).

Any conclusions drawn can only be tentative since there were only a small number of subjects involved. They are however encouraging and suggest a potential basis for a larger study. The main objective of the pilot study to identify procedural problems which may be resolved and thereby introduce a good degree of control in the main study. It was decided with a few modifications a larger study would be possible.

The practicalities of this method of data collection were reconsidered. Due to the limited amount of information obtained related to pain experiences in the pilot study it was essential to obtain a larger more representative sample size. Within this Coronary Care Unit approximately 600 patients per year are admitted with myocardial infarction. In addition there were 20 trained staff and 4 untrained staff employed in the unit. The pilot study only allowed observation of the behaviour of the 7 staff who were on duty over this 24 hour period and it was possible their behaviour was different from the remaining staff employed within the unit, therefore it was important to observe the behaviour of the remaining staff in order to increase the accuracy of the sample and the strength of any conclusions which may be drawn from this observation. This was achieved by recording nurse patient interactions over a two week period as this provided the researcher with the opportunity to observe the behaviour of all staff within the unit, taking into consideration the shift patterns and the fact some staff were employed only part time, and therefore might only have been present for two shifts per week. It was recognised that to record and analyse all nurse patient interactions would be extremely time consuming, and not necessarily worthwhile as on average 14.5% of the interactions recorded were related to pain. Employing this method would have generated a large amount of irrelevant data. It was therefore decided to measure only the interactions related to pain. The modified method is described in the next study (section 3.2).

Completion of the pilot study provided insight into the best way to complete a larger scale study involving larger numbers of staff and patients over a longer time period to provide more representative data. It was essential to provide an adequate supply of clearly labelled recording sheets and tapes. Each tape recorder was attached to the mains but batteries were also inserted to prevent unnecessary loss of data if the connection was loose or the mains supply inadvertently switched off. The completion of the pilot study provided valuable experience and guided the conduct of a larger study to measure interactions between

patients in pain and nurses in a Coronary Care Unit which will now be described in more detail.

3.2 Measurement Of Nurse Patient Interactions Related To Pain Before And After An In Service Study Day On Pain And Its Management.

3.2.1 Introduction.

It is likely that the processes which occur during nurse-patient interactions can have a major influence on the treatment of a patient's pain. Nursing staff spend more time with patients in pain than any other health care professional and have been described as the cornerstone of pain control (McCaffery and Beebe, 1989). Within the clinical setting nurses have an important role to play in the assessment of pain and the administration of analgesics.

The lack of education has frequently been cited as a reason for inadequate treatment of pain amongst nursing and medical staff (Bonica, 1987, Brockopp, 1993, Brunier et al., 1995, Ferrell, et al., !993, Soafer, 1983; Sullivan 1994,). Since 1988 McCaffery and Ferrell have shown by surveying over 4000 nurses in the USA and Canada that they lack knowledge about the assessment and relief of pain. This was supported by Brunnier et al. (1995) who surveyed the attitudes and knowledge of 514 Canadian nurses employed in acute and long term care and found this was far from optimal.

In determining whether a patient is in pain, less than 75% of nurses surveyed reported that they would ask a direct question (Dalton, 1989). The responses to a survey in 1990 of 446 nurses in USA showed over 55% did not know that the patients report of pain was the most reliable indicator of pain. This opposes the recommendations of the American Pain Society (1992) who stated the clinician must accept the patient's report of pain. It can be argued this statement applies equally to all staff in contact with patients in pain, therefore any health care professional caring for patients in pain should believe and accept the patients report of pain.

Despite these recommendations, studies from Australia have shown that the staff base their assessment of pain on patients' behaviour rather than reports of pain which suggests their personal opinions and judgements will then influence their professional conduct. Between 46% and 67% of nurses questioned failed to increase the dose of an analgesic when the first dose had been ineffective. In addition they had reported exaggerated fears of addiction. Similar results were reported following unstructured interviews with staff in relation to their beliefs of how post operative pain should be managed (Wakefield 1995). The results showed that nurses still categorised patients in relation to their clinical symptoms and overt behaviour thus suggesting staff may not always believe that pain is causing the patient distress.

It has been suggested the introduction of simple pain assessment tools and documentation will encourage a systematic assessment of patients' pain (Davis, 1988; McNaull et al., 1992; O'Conner 1995, Swanston et al., 1993; Watt-Watson, 1987) This will also help maximise the accuracy of the information and allow appropriate intervention and treatment (Walker et al., 1989).

Beetson (1994) suggested the assessment of patients with ischaemia should be prompt and systematic and include pain intensity as well as the psychological status and physiological response for example those demonstrated in the acute pain model i.e. increased heart rate, pulse and blood pressure, pallor and diaphoresis (McCaffery and Beebe, 1989). However rapid physiological and behavioural adaptation to maintain equilibrium may dissipate these responses thus removing the objective evidence of pain. Staff must therefore rely on patients' verbal reports of pain which are still the most reliable indices. Work carried out by Teske, Daut and Cleeland (1983) studied relationships between nurses' observations and patients self reports of pain. They concluded that even nurse observers who had been trained to recognise and standardise potential pain indicators on a 7 point scale of 0-6 where 0 = none to 6 = extreme pain, demonstrated they would inaccurately estimate pain severity most of the time. This was reflected in the correlation coefficients based on the sum of the observers' rating scores and the patients' self reports of pain being 0.28 for chronic and 0.32 for acute pain.

A variety of factors can influence pain expression (Davitz et al., 1981, Houde, 1982) and assessment (Alpen and Titler, 1994; McCaffery, 1983, Sullivan, 1994). Education and training of staff in methods of pain relief in accordance with identified needs may be beneficial (Dodson, 1982; Mather and Mackie, 1983). Numerous studies have shown that health care professionals assess and treat pain inadequately (Heindrich and Perry, 1982; Lloyd and Mclauchlan, 1994 Twycross, 1984). Staff may be overconfident in their abilities to tell when patients are experiencing pain (McCaffery and Beebe, 1989; Cleeland, 1985; Soafer, 1984). Soafer (1986) attempted to assess a clinically based programme for nurses and compared pain intensities in patients who had undergone similar operative procedures assessed by staff who attended and did not attend the pain management programme and found those who attended the programme were more prepared to take responsibility for picking up pain cues, were more concerned with relieving pain and the patient's pain was noticed by these nurses more often. The effects of community based, multi disciplinary programmes to improve pain management for cancer patients have also been reported a s beneficial in improving the management of cancer pain by changing knowledge attitudes and behaviour of patients, their families and the health care staff involved in pain management. In addition to utilising teaching programmes it has also been suggested that problems which exist in pain assessment and management may be eliminated by a

systematic approach to pain assessment (Gaston-Johanssen et al., 1988). The utilisation of assessment tools may improve accountability for pain relief, which is an essential part of the nurses role (McGuire, 1994, Strauss et al., 1974).

The completion of the pilot study previously reported (section 3.1) suggested communication was of very short duration and often nurse dominated. The previous discussion in chapter 1, section 1.9.1 suggested that the patients themselves may not be willing to communicate their pain. The education of staff may contribute to deficiencies in pain management as discussed previously. In order to establish whether a training programme would improve the performance of the nursing staff in pain assessment and management within CCU it was necessary to design a study to observe and measure the staff's performance before and after completing a training programme on pain management. The techniques used in the pilot study were applied to a larger group (N =20) over a longer time period (2, two week periods) so as to provide a representative sample of staff behaviour in the Coronary Care Unit.

This study was designed to answer the following questions

1) What is the duration of interaction of staff with patients when communicating with patients who are in pain in CCU?

2) When staff interact with patients in pain do they ask relevant questions in assessing pain?

3) Would the completion of an educational programme about pain and its management alter staff behaviour i.e. the duration or content of their communication when interacting with patients in pain

An additional important purpose of the training programme was to try to standardise the practice of nursing staff when assessing pain within CCU. They would all use the same method of pain assessment and optimise the practice they employed in the management of cardiac pain. This may have encouraged management to be focused on pain relief, reduction of anxiety and resolution of the imbalance between myocardial oxygen supply and demand as advocated by Beetson (1994). Having provided the staff with the opportunity to employ best practice it would then be possible to compare the administration of drugs by staff trained to a high standard with self administration of analgesics by patients using PCAS to determine whether PCA offered any benefit in the management of cardiac pain.

3.2.2 METHOD

This study consisted of three parts. Firstly the collection of data over a two week period related to how staff interact with patients in pain measuring the duration of the interactions and the content of the interactions. This provided information on current practice within a Coronary Care Unit. Secondly the nursing staff were all invited to attend an educational programme lasting a full day related to pain and its management. The third part of the study was a repetition of the initial 2 week period of data collection related to nurse patient interactions to evaluate any change in behaviour.

The design used may be described as pre-experimental; a one group pre-test post-test design. This design has been described as having inherent weaknesses. Since an observation is occurring, the pre-test scores cannot serve as a control group. It is also possible between the time of the pre-test and post test, independent events can occur which may alter the responses observed during the second period of measurement. It may then be argued these independent events have caused any change observed rather than the intervention. The post test scores may have been altered by maturation processes or the completion of the pre-test. Any changes in instrumentation may also affect the behaviour seen in the second time period. This completion of the pre-test measures at more than one time interval greatly strengthens the design (Burns et al., 1993). In an attempt to reduce these potential bias of observing the behaviour of staff in the study, the researcher carried out the same measures for the pre and post test observations. In addition to help prevent effects by maturation processes there was a relatively short period of time which lapsed from the first series of measures of nurse patient interaction to the second. The researcher also attempted to encourage all staff to attend the educational training day on pain and its management within a short time period to avoid changes in the practice of the first group from influencing the second group. The measurements of interactions were carried out for 14 days ending on the Sunday. The educational study days were attended either on the Tuesday or Friday of the following week and then repeat recordings and measurements of interactions were made for a two week period from the following Sunday (Table 3.8).

Table 3.8 Representation of Study Time Frame

Time	Activity
Week 1	Recording of nurse patient interactions
Week 2	Recording of nurse patient interactions
Week 3	Educational study days (Tuesday & Friday)
Week 4	Recording of nurse patient interactions
Week 5	Recording of nurse patient interactions

3.2.2.1 Participants

Nursing staff:

This study involved a convenience sample of 20 staff employed in CCU at that time. The grades of staff are shown in Table 3.9. All staff were invited to participate in the collection of data related to nurse patient interactions when patients were in pain. An explanation of their role in the collection of data was given and the opportunity given for any questions they may have to be answered. Each member of staff was invited to attend the Study day on pain management either on Tuesday 27th or Friday 30th August 1991. A total of 15 staff attended. The remainder were at that time on annual leave. No member of staff refused to participate.

Table 3.9 Age And Employment Profile Of The Nursing Staff

Characteristics	Number of Nurses
Age (Years)	
21-30	15
31-40	3
41-50	2
Nursing Experience (Years)	
0-5	8
6-10	7
10 or more	5
CCU Nursing Experience	
0-5	16
6-10	2
10 or more	2
Nursing Education	
RGN	16
EN	5
BSc/BN	4*
Post Basic Course	3
Work Status	
Full Time	14
Part Time	6

* nurses with BSc/BN could also hold an RGN qualification.

Patients:

During the study period a total of 91 patients were admitted. Forty five in the first two week period and 46 in the second two week period. Their principal diagnosis is demonstrated in Table 3.10.

Table 3.10 Gender and Diagnosis of In-patients in CCU Before and After the Study Day

Diagnosis	Males Pre study Day	Males Post Study Day	Females Pre Study Day	Females Post Study Day	Total
Myocardial Infarction	7	11	3	6	27
Angina	11	6	8	3	28
Arrhythmias	2	6	3	2	13
Post Arrest.	0	0	1	0	1
Investigations	1	2	0	0	3
Pacemaker Insertion	0	3	3	2	4
Left Ventricular Failure	2	0	0	2	7
Other*	2	2	3	0	7

* Other includes dissecting aorta, musculoskeletal pain, cardiac biopsy, collapse, left ventricular hypertrophy, pulmonary embolus, gastric regurgitation and pain of unknown aetiology.

The mean age of the study population is represented below in Table 3.11 and can be seen to be comparable.

Table 3. 11 Mean Age of Study Population

Mean Age	Males	Females
Before study day	61.8	63.3
After study day	64.5	64.4

All patients admitted to the unit during the two week period from August 12th 1991 to August 25th 1991 then from the 1st to the 14th September 1991 were informed about the study and asked to participate. All patients who were approached agreed to participate. This involved a total of 91 patients. During the time period two patients were excluded from the study. The first was a 60 year old man who had a psychiatric illness. During his time in CCU he had suffered a period of acute psychosis. It was decided the introduction of tape recorders in this room could be detrimental to his mental state. The second occasion involved a patient who had deteriorating renal function. As a result of electrolyte imbalance he had become extremely agitated, disorientated and displayed aggressive behaviour to both nursing and medical staff. Recordings of interactions in his room were discontinued.

3.2 3. Procedure

3.2.3.1 Recording interactions

Nine small tape recorders and adapters had been purchased and one placed in each room in CCU after being checked for appropriate function. Tapes were labelled with room and tape numbers (e.g. Room 1 Tape 1,2,3...) and placed beside the tape recorders in each room. Recording sheets (as in study 1) were used for collection of date and time of interaction, tape counter number and staff signatures.

The nursing staff had all been instructed in the method of recruitment and data collection by the researcher. The opportunity was given to discuss any potential problems and questions answered. Data were collected in two ways. The nurses switched on the tape recorders if they entered the room either with the intention of asking the patient how they

were feeling or if they had pain and also when the patient called for the nurse in case the reason for their call was that they were experiencing pain.

3.2.3.2 Pain Assessment Questionnaire

In the week preceding the study day all staff in the unit were asked to complete a questionnaire related to the various aspects of pain and whether these factors were assessed or not (see appendix XI). This questionnaire was adapted from a tool used in an A & E department to determine the perception of emergency department nurses regarding pain and the various aspects of pain that are routinely assessed (Hoyt and Sparger, 1984). The tool was intended to act as a comparison to the nurses observed behaviour in nurse patient interactions i.e. did the nurses do what they said they did?

The nursing staff attended the study day entitled 'Pain and its Management' either on Tuesday 27th or Friday 30th August 1991 from 09.30 to 17.00 hours. In order to optimise staff attendance cover was arranged to allow night staff to attend and all staff present were given a day off in lieu.

3.2.3.3. Pain Management Study Day

The aim of this day was to provide a training programme related to pain and its management. After the completion of this training programme staff behaviour while interacting with patients in pain would be re-examined and any changes evaluated.

3.2.3.4 Planning of the Educational Programme

The planning and preparation of the educational programme was done over a period of three months. Traditionally it has been assumed in nurse education that it is possible to improve health care by changing behaviour and practice. These behavioural changes are believed to be possible by the acquisition of new knowledge and skills which will be retained by staff and translated into improved health care (Peden 1992). It was suggested by Davis (1988) that the increased understanding of pain management would improve nursing practice greatly and ensure the adoption of pain assessment charts. Soafer (1983) also advocated the need for an educational programme to promote the implementation of innovations.

Consultation with experts in the field of nurse education and reference to the educational literature directed the programme and content of study. A literature review of pain, its assessment and management was completed. The educational programme was planned

using principles of Competency Based Instruction (CBI) (Sullivan and Higgins 1983), interactive learning and role play. Competency based instruction aims to enable the students to acquire the skills and attitudes reflected in the objectives which have been set. Work in educational psychology has shown that interactive learning programmes produce better results (Ley, 1977). Students are found to learn more by involvement in the learning process particularly when the subject matter has relevance and meaning to the learner (Weinstein 1970). Role play is thought to be a useful method of developing effective skills in nurses (Basford, 1990). Not only can role play help close the gap between what people know and how they apply it, but it can serve as a training method to deal with almost any type of situation where face to face interactions are involved. This allowed the staff to take on the role of the patient in a variety of difficult or problematical situations related to communicating with patients in pain.

Studies related to the attention span and retention of knowledge suggest short periods of concentration are better. The overall content of the day was produced and refined on the basis of advice obtained from expert tutors and nurse teachers involved in basic and post basic nurse education. The challenge of maintaining the attention of the students has been reported as one of the greatest to a teacher (Quinn, 1980). Attention often falls off rapidly after the first 10-15 minutes therefore a variety of strategies were implemented to prevent this which will be described in section 3.2.3.5

The content of the day was planned to aim to meet the deficits in current training highlighted in the literature. Harrison (1991) reported current training appears to equip both nursing and medical staff with insufficient knowledge on the cause of pain, methods of assessment, drug options and pharmacokinetics to allow selection of optimal dosage levels and monitor the efficacy of the treatment selected. Insufficient education also results in the persistence of several common myths which may impede progress in pain management (Faries et al., 1991). Lack of recognition of the variation in patient responses and lack of knowledge of the legal requirements related to documentation of pain assessment and intervention results in inadequate care (Dalton, 1989, O'Conner 1995).

3.2.3.5 Programme of the Study Day

The programme was designed to include the areas of deficit previously highlighted. A set of objectives related to the principles of pain management were defined then the content of the day based around this (see appendix XII). Throughout the day it was intended to encourage discussion and exploration of the individual staff's attitudes and approaches to pain management considering assessment methods, intervention strategies and evaluation of pain management. Discussion and feedback were encouraged to foster learning from

each other's experience. The content included general principles of pain management considering assessment, intervention and evaluation of pain. A review of current research and the nurse's role in pain management was presented (Bonica, 1990; McCaffery and Beebe, 1989). Consideration was given to the factors which make pain management difficult and may influence staff and patient behaviour (McCaffery, 1983). Physiology and pain mechanisms were reviewed with particular emphasis on cardiac pain (Hammermeister, 1990; Bonica, 1990; Bonica, 1987). The pharmacological and non pharmacological methods of pain relief were also considered (Latham, 1991, Benedetti and Butler, 1990, Blanchard and Ahles, 1990, Syrjala, 1990).

A variety of teaching/learning techniques were utilised. Each individual session will be described in more detail. Certain subjects were covered using formal teaching sessions supplemented by visual material which can be a powerful device to gain attention. Others were explored and addressed by involving the students in 'Buzz Groups' in which the students formed groups of 4-6 adjusting their seating to face the students behind them. These small buzz groups then spent a few minutes discussing some aspect of the topic then feedback is invited to the whole group. In addition, group work and role play were used with feedback after each session. This allowed expression of feelings and practice of techniques which were then discussed. Audio tapes were used in an exercise to identify different types of pain in clinical scenarios. The technique is described in more detail below. A video recording related to acute pain management was observed and the issues it raised (e.g. patient and staff behaviour) discussed. The role of behavioural and complementary therapies in pain management were presented and the participants took part in relaxation exercises to allow experience of the potential benefit which could be derived by this technique.

Each passive learning situation was interspersed between active sessions and the variety of activities aimed to maintain motivation and attention. All staff received a hand out relating to many of the issues and management principles covered in the day. This supplemented much of the information given and concepts explored.

The study day commenced at 09.00 hours with a brief introduction followed by a review of the current status in pain management which lasted 45 minutes. This included a review of the literature and recent research based findings related to pain and its management.

The following hour involved the completion of group exercises which are used regularly in a post basic course related to pain management. The first exercise considered the nurse's role in pain management, encouraging staff to share their personal experience of pain (Appendix XIII). The second exercise involved discussing a patient they had nursed

recently in pain (Appendix XIV). The third exercise related to factors which could influence pain behaviours and staff perception of pain and asked the participants to develop a framework for pain assessment and discuss pain relieving interventions (Appendix XV). The group reconvened and feedback was obtained discussing the issues raised.

Thirty minutes was devoted to a brief review of physiology with particular emphasis on myocardial ischaemia. This information was supplemented in the written package which all staff received following the study day. Additional reading material was suggested for individual study.

A further interactive session of 20 minutes followed, where nurses were asked to analyse a variety of types of pain patients may suffer. This was done by listening to audio taped scenarios which described case presentations with signs and symptoms of pain. Staff identified the cause of the pain and discussed effective treatments. The use of scenarios to develop nurses' competence has been used in previous pain management programmes. The instructor then evaluated the session and provided feedback to the participants.

The final session before lunch was of 40 minutes duration which considered the experience of pain and factors which inhibit pain assessment and management (McCaffery et al., 1976). It was at this point a tool for the assessment and documentation of pain was introduced (Appendix IV). The tool chosen for the assessment of pain intensity was the numerical rating scale. This was chosen due to its ease in administration in both the written and oral form, it's ease of scoring and lack of age-related difficulty (Jenson 1986). The Numerical Rating Scale has also been shown to be comparable to the Visual Analogue Scale in terms of the number of patients who responded comparably, and in construct validity. The tool for the qualitative assessment of the pain (including location, quality, duration, aggravating and relieving factors) is shown in Appendix IV. This included pictures related to the typical sites of pain in MI as well as a blank body chart to allow the indication of pain originating from a different site. This was adapted from the London hospital chart with modifications specific to the presentation of ischaemic pain (Bonica, 1990). In addition to the pictorial representations a list of words was presented from which the patient could choose the one which most closely described his cardiac pain. The list of descriptors was determined from previous reported studies (Berker et al., 1990; Gaston-Johnansson et al., 1991). Within the chart there was space to include the date, time, the nurses and patients assessment of their pain using the numerical rating scale. The nurse also recorded what the patient was doing at the time of the pain episode, any analgesia given and evaluated its effects.

The afternoon session commenced with the viewing (45 minutes) of a video entitled "Anything for pain" produced by North West Thames Regional Health Authority based on research studies related to clinical practice (Seers and Goodman, 1987a). This described the pain experiences and management of acute pain in a post-operative surgical unit. Following an extensive search for relevant material there was no video produced relating to cardiac pain. Many available video tapes concentrated on chronic and cancer pain therefore this was thought to be the most relevant to the situation of cardiac patients in acute pain.

This was followed by a 45 minute session on the pharmacological management of pain. This reviewed the main categories of analgesics including narcotic agents, non steroidal anti-inflammatory agents, nitrates and simple analgesics. For each drug the indications for use, mode and duration of action and side effects was considered. The principles of the analgesic ladder and its relevance to clinical practice was presented (WHO 1986). Emphasis was placed on the treatments commonly used in the management of pain following myocardial infarction especially narcotic drugs as previous studies have shown nursing staff's administration of narcotic agents may be hampered by erroneous fears of addiction and side effects (Watt-Watson, 1987; Gaston-Johnansson et al., 1991) The nurse's role and responsibility related to drug administration and evaluation of therapy was also discussed.

The penultimate session looked at non pharmacological interventions in pain management (Latham, 1991; Haft et al., 1985; Mayou, 1991). The staff were invited to participate in techniques such as biofeedback and relaxation techniques. All staff participated in the relaxation exercises. A simple technique of muscle relaxation was used listening to an audio tape. A copy of relaxation techniques which could be used in the unit as described by (Bernstein et al., 1973) was also given to the staff. This was done to try to encourage the use of simple behavioural techniques. It has previously been suggested staff do not teach behavioural strategies because they do not believe they work nor that they themselves had the necessary skills or knowledge to complete them (Dalton, 1989).

The study programme was completed with a 15 minute session in which the main points of the day were summarised. The pain chart to be introduced was reinforced. The staff were asked to consider whether anything they had gained from this day could be utilised in their clinical practice.

The educational programme itself was not evaluated by the participants formally but anecdotal feedback to the researcher was positive. Following the completion of these study days, attended by 9 staff on Tuesday and 7 staff on Friday, repeat recordings of nurse

patient interactions were commenced for a further two week period from 1st to 14th September 1991.

A potential weakness in the study design should be highlighted at this point. Since the research study was being conducted in the Coronary Care Unit which often provides care for patients following emergency admission to hospital, it was impossible to have the same patient population in the unit during the second two week period when nurse patient interactions were recorded and measured. This is the disadvantage which occurs in conducting research within a clinical setting as opposed to a controlled laboratory situation. However the advantage is any findings can be directly applied to clinical practice.

It is clear since communication is a two way process, it can be influenced by both the nurse and the patient. Due to the turnover of patients in the unit a different patient population was present during the second period of measurement. The nursing staff were the consistent factor in the two time periods. The researcher was therefore more interested in analysing the verbal behaviour of the nursing staff, to observe any changes which occurred in nurse patient communication. The nurses had the ability to direct the communication which occurred by the questions that they asked the patients. It was therefore of interest to record any change in the number and relevance of questions they asked when assessing pain. The results will be discussed in the following section.

3.2.4 RESULTS:

The recordings of interactions made for the two week period before the study day involved a total of 14 nursing staff who interacted with patients in pain. (The results of the researcher were not included in the analysis although participation had been considered essential to maximise staff compliance with data collection). A total of 100 interactions were analysed during the first two week period.

The recordings of nurse patient interactions were repeated for the specified two week period after the study day and involved 12 nursing staff (excluding the researcher). A total of 60 interactions were analysed. Due to several variables including annual leave, patient's pain experiences and the allocation of nurses to patients, not all nurses who were included on the pre study day recordings were also on the post study day recordings. There was a total of nine nurses who were present on both occasions. The removal of the interactions with patients by nurses who were not present on both occasions resulted in the analysis of 76 interactions before and 51 interactions after the study day.

3.2.4.1 Duration of Nurse Patient Interactions

The duration and content of the nurse-patient interactions were analysed. The timing of the duration of the interactions was carried out using the method previously described in the pilot study. In order to determine the reliability of the results the timing of a sample of the interactions was repeated by an independent rater using the same method as the researcher. A regression analysis revealed the regression line of rater 1 's time against rater 2's time was C1=0.841 + 0.944 C2. If the observers times are consistent we would expect to find the line y = x; i.e. constant = 0, gradient = 1. 95% confidence interval for constant contained 0 [0.841+/- 2 x 0.782 (-0.723,2.405)] and gradient contained 1 [0.944+/- 2 x 0.103 (0.738,1.15)].

The tapes were replayed using a personal hi-fi and the conversations were transcribed. The results are presented in section 3.4.1.

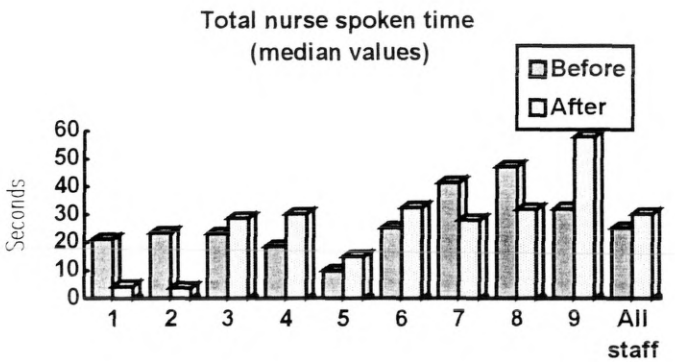
To code the content of the nurse patient verbal interactions, a form was devised by the researcher to determine the frequency with which staff assess specific factors related to pain during their verbal communication with patients (Appendix XVI). The form included a list of items related to the information necessary to be obtained during an assessment of pain which was produced based on the recommendations of experts in the field of pain management (Camp and O'Sullivan 1987; McCaffery and Beebe, 1989). The categories included were location, intensity, duration and quality of pain as well as aggravating and

relieving factors. These were the categories in previous studies in which staff had consistently obtained information. (Camp and O'Sullivan 1987, Herr et al., 1991). Additional information which was relevant in the assessment and management of cardiac pain was included e.g. was a scale used to score pain intensity, was an ECG performed, were patients informed of their planned treatment and was the cause of their pain explained to them? Each interaction was then analysed and it was noted whether or not this information was obtained. These measurements were repeated before and after the study day. It was at times difficult to hear the conversations however the subsequent transcription of the nurse patient conversations allowed the opportunity to check the content of the interactions. The categorisation of the information was completed by the researcher and an independent rater. Total agreement was found in 76 % of cases. Rater 1 identified instances where rater 2 had not and vice versa. The high degree of agreement however suggests the categorisation of data in this manner was reliable and could be replicated in future work. The results are presented in appendix XVI. The results of the duration of nurse patient interactions will now be presented (Tables 3.12 -3.15).

Table 3.12 Total Spoken Time of Nurses with Patients in Pain (Median Values Expressed In Seconds)

Nurse	Before Training	After Training
1	21.1	4.3
2	23.4	3.7
3	23.2	28.65
4	18.55	30.3
5	9.9	15
6	25.2	32.55
7	41.4	28
8	47.1	31.8
9	32.15	57.9
Median Time for all Nurses	25.2	28.65

Figure 3.1 Total Spoken Time of Nurses with Patients in Pain



The duration of the nurse-patient verbal interaction times was extremely variable producing a skewed distribution of results. It was therefore thought more representative to measure the median values of the duration of nurse and patient spoken time within the verbal interactions.

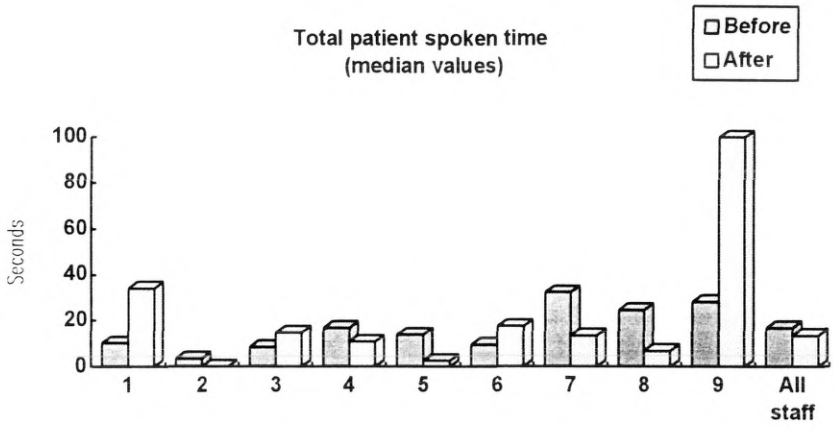
The results show that following the study day the median values of the nurse spoken interaction time increased in 5/9 cases (figure 3.1). The overall median spoken time increased slightly. The differences before and after the study day were compared using a wilcoxon test and found to be non significant (N=9, T = 26, P > 0.05 NS).

The patients spoken times were also analysed and are presented in Table 3.13.

Table 3.13 Total Spoken Time of Patients (Median Values Expressed In Seconds)

Nurse	Before Staff Training	After Staff Training
1	10.3	34.1
2	23.5	0
3	8.4	14.75
4	16.9	10.85
5	13.9	2.5
6	9.55	17.5
7	32.35	13.5
8	24.6	6.8
9	28.3	195
Median Time for Patients	16.9	13.5

Figure 3.2 Total Spoken Time of Patients (Median Values)



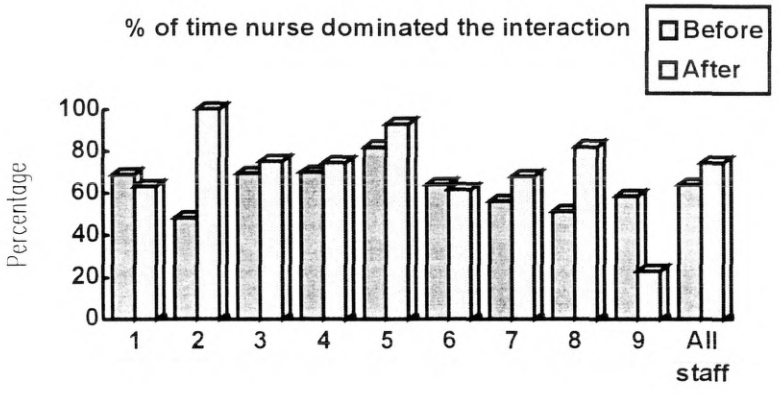
The median spoken times for the patients increased in 4/9 cases. The overall trend in the medians was a decrease in the duration of the patients spoken time. Analysis using a Mann Whitney test showed no significant difference (P>0.05 NS).

The following results show the percentage of time the nurse dominated the interaction.

Table 3.14 Percentage Of Time Nurse Dominated The Interaction (Median Values)

Nurse	Before Training	After Training
1	69	63
2	48	100
3	69.5	75
4	70	74.5
5	82	93
6	64	61.5
7	56	68
8	51	82
9	58.5	23
Median value for all nurses	64	74.5

Figure 3.3 Percentage of Time Nurse Dominated the Interaction



The percentage of time the nurse dominated the interaction was measured (i.e. the % of time she spoke within a nurse patient verbal interaction) and showed a trend to increase in 6/9 cases. Overall there was an increase in the percentage of the interaction dominated by the nursing staff when it was expected a decrease would occur, however a Wilcoxon test showed no significant difference (N= 9,T = 13, P > 0.05 NS).

Table 3.15 Total Nurse And Patient Verbal Interaction Time Expressed In Seconds, Median Values

Nurse	Before Training	After Training
1	28.5	78.7
2	48.6	3.7
3	28.6	43.7
4	38.1	39.4
5	9.9	16.3
6	30.6	49.7
7	62.8	41.5
8	71.7	38.6
9	53.6	252.9
All	38.1	43.7

Similarly the total nurse patient interaction time increased on 6/9 occasions. The change was not statistically significant although the overall trend showed an increase (N=9, T= 18, P>0.05).

How often did nurses interact with patients in pain?

The frequency with which staff interacted with patients was also calculated. There was variability in the number of times this occurred therefore the median values were calculated. The median number of interactions nurses had with patients before and after the study day was 6 interactions per nurse (range 1-17 and 1-12 respectively). there was no change in number of interactions staff had with patients after the study day.

3.2.4.2 Content Analysis of Nurse Patient Verbal Interactions

The researcher had identified a list of items which it was desirable to obtain during an assessment of pain. The recorded interactions were replayed and transcribed and within each interaction the number of times information was obtained related to this factor was recorded before and after the study day. The results are expressed as a percentage of the interactions in the table below (Table 3.16)

Table 3.16 Information Obtained During Pain Assessment

Information obtained	% of times before study day	% of times after study day
Onset of pain	5	12
Duration	13	22
Location	30	34
Quality	44	51
Intensity	34	78
(with scale)	8	15
Radiation	15	12
Aggravating factors	13	22
Relieving factors	21	44
Associated symptoms	13	17
Presence of pain	49	90

The results show on many occasions staff do not obtain relevant information when they assess pain. After training some factors improved however there was still a great potential for improvement in practice. The differences in the two time periods can be seen more clearly in the graphic representation below (Figure 3.4).

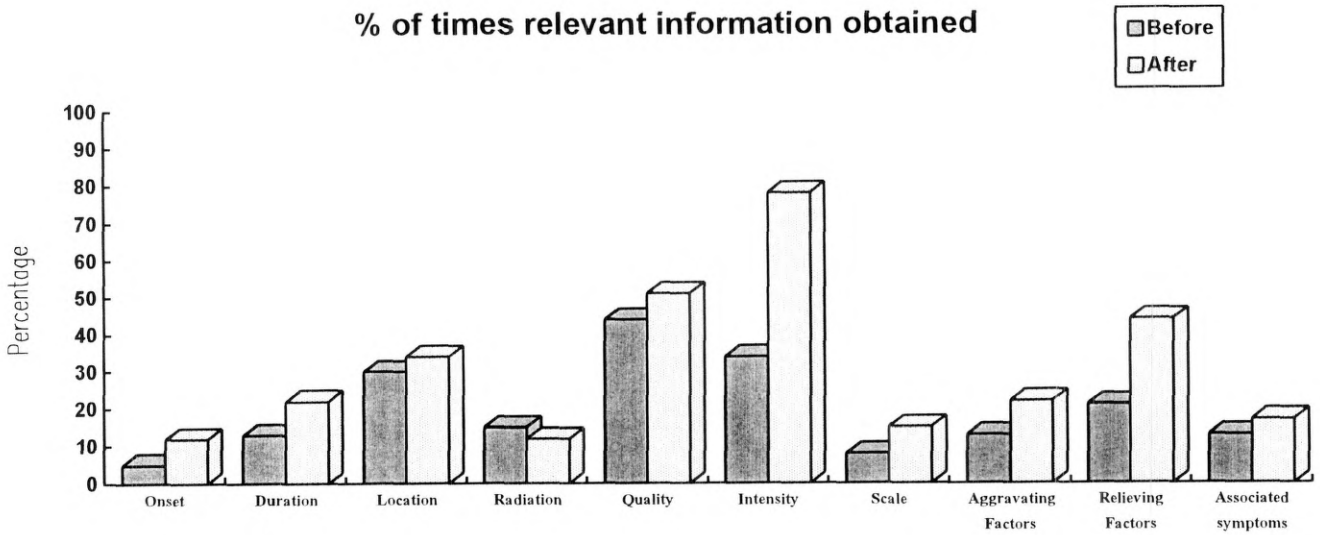


Figure 3.4 Percentage of Times Relevant Information Obtained During Interactions Before and After Taining

Prior to the study day the staff were asked to complete a questionnaire to determine how they thought they assessed pain. This revealed their perceptions of what they asked when interacting with patients in pain. The results were compared to the recorded interactions and are presented below.

Table 3.17 Comparison Of Recorded Interactions And The Nurses Perceptions Of Their Behaviour When Assessing Pain

Factor Assessed	Incidence reported in questionnaire	Observed interaction before study day	Observed interaction after the study day
Onset of pain	92	5	12
Duration	92	13	22
Location	76	30	34
Radiation	*	15	12
Quality	100	44	51
Intensity	76	34	78
(with scale)	61	8	15
Aggravating factors	28	13	22
Relieving factors	23	21	44
Associated symptoms	61	13	17

* not recorded

The results of this study allowed the researcher to determine how often the nurse obtained information related to the factors which had been identified as important in assessing pain

(e.g. location, intensity, etc. McCaffery and Beebe, 1989, O'Conner, 1995). The number of times this information was obtained was calculated by analysing the pain assessments before and after the study day. The results showed information was obtained was obtained for the majority of important aspects in pain assessment more often after the study day than before. In order of frequency, the aspects assessed most often were the presence, intensity, quality, relieving factors, location and aggravating factors. In relation to the radiation of pain, the frequency of information obtained reduced. Analysis using the sign test demonstrated a significant difference in the proportion of scores which increased after the study day ($P < 0.05$). It therefore suggests that the study day had a significant impact upon the behaviour of staff in assessing pain in cardiac patients.

The completion of this analysis clearly showed that the nurses perceptions of how they assessed cardiac pain were different from how they actually assessed pain in practice. This objective evidence highlights the need to improve the method of pain assessment in Coronary Care.

3.2.5 Discussion.

Following the study day the median values of the nurse spoken interaction time increased in 5/9 cases (Table 3.12). The overall median spoken time increased. The differences before and after the study day were compared using a Wilcoxon test and found to be non significant (T=26, P>0.05). The frequency of interactions before the study day was 6 interactions per nurse (median value, range 1-17) and after the study day 6 interactions (range 1-12).

The median spoken times for the patients decreased in 4/9 cases (Table 3.13). This was in contrast to the desired effect i.e. following the educational programme it was expected more time would be given to allow patients to speak. The overall median spoken time decreased in the duration of the patients spoken time. Analysis using a Mann Whitney showed no significant difference (P>0.05).

The percentage of time the nurse dominated the interaction was measured and showed an increase in 6/9 cases (Figure 3.5). Overall there was an increase in the percentage of the interaction dominated by the nursing staff when it was expected a decrease would occur. Analysis using the Wilcoxon test showed no significant difference (T=13 P>0.05).

Similarly the total nurse patient interaction time increased on 6/9 occasions (Table 3.15). The change was not statistically significant although overall an increase in the total interaction time occurred (T=18, P>0.05).

Therefore it can be concluded that despite training and educating the staff, no obvious pattern of altered behaviour was seen related to duration and frequency of interaction of nurses before and after the study day. It is important to acknowledge that the small sample size may have influenced the results obtained. A recent investigation which would have occurred at the same time as this study has also found that experienced critical care nurses use short effective questions for the assessment of cardiac pain (Guyton-Simmons and Mattoon (1991).

Like the results shown in the pilot study this data once more demonstrated wide variability in the duration and frequency of interactions between individual nursing staff and patients. Prior to the study day the median duration of all nurses interacting with a patient in pain was approximately 25.2 seconds (range 10.0 - 47.1 seconds). Following the study day the median interaction time was 28.6 seconds (range 3.7 - 57.9 seconds).

In completing the same analysis for the patients proportion of the interactions again there are no significant differences. However a subtle change was demonstrated in the duration of time the patients spoke for from a total of 1657 seconds (median 115 seconds) to 1692 seconds (median 128 seconds). This slight change may have suggested that staff allowed the patients to speak for longer or actually used questions which encouraged patients to provide the information desired. It may simply have been explained by a different patient population being present in the unit in the second time period.

There was also a noticeable reduction in the number of interactions which took place in the two week period after the study day. This could have been due to a number of factors e.g. perhaps staff switched on the tapes less often or the patients in the unit experienced less pain.

In attempting to explain the reduction in episodes of reported pain, the bed occupancy figures were reviewed. Between the 12-25th August 46 patients were admitted to CCU and between the 1st-14th September 45 patients were admitted to the unit. The total numbers were comparable. Identification of the reason for admission to CCU (Table 3.10) revealed the number of patients who were admitted with chest pain and possible myocardial infarction. Since the management of definite and suspected myocardial infarction would be the same these two groups are combined and found to represent 29 patients before and 26 patients after the study day.

The amount of opiates given in these two time periods was also reviewed. It may have been the result of increased doses of analgesia being given which resulted in less pain being experienced by patients in the sample collected after the study day. The total doses of diamorphine given to patients were 89.5 mg and 222 mg respectively (Figure 3.5). This change can best be seen graphically.

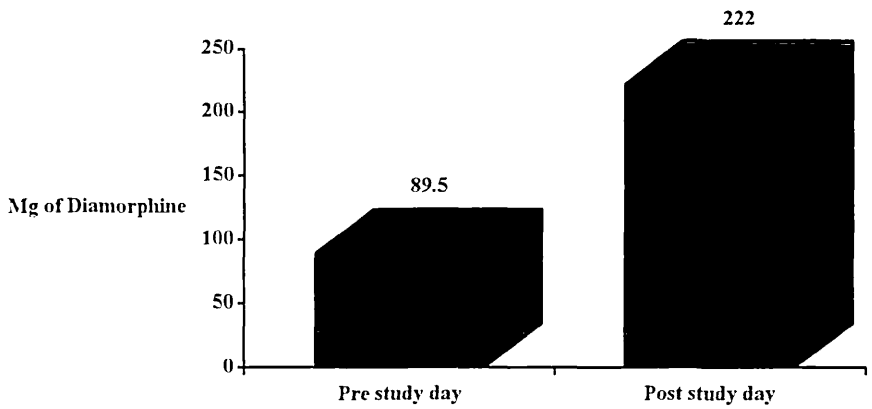


Figure 3.5 Diamorphine Administration in CCU Before and After Attending a Training Programme

This demonstrated almost an increase of 148% in the total amount of narcotic analgesics administered. Although this was not the specific effect of training which was being measured this was a very interesting finding. As has been discussed in Chapter 1, section 1.10. There are numerous reports in the literature which reveal nurses are reluctant to administer analgesia, frequently underestimate the amount which should be given, and have exaggerated beliefs about overdose, side effects and addiction (McCaffery and Ferrell, 1992, Ferrell et al., 1992, Fothergill et al, 1992,). The results of this study suggest that the training programme described in this study and the manner in which it was delivered may have successfully overcome this problem. A substantial increase in the use of opiates was observed. A variety of possible explanations for this change in behaviour may be given. The staff were more aware of patients' pain as the study day had caused them to focus on the pain experienced by patients. It may have been because there was an alteration in the behaviour of nurses. It is possible like many other practising nurses, they had previously been influenced by the misconceptions related to opiates which have previously been discussed. Alleviation of erroneous fears and acceptance of the incongruous behaviour which can be seen by patients in pain may have resulted in awareness of their own attitudes which could influence practice. A recent study by Brunier et al., (1995) reported that nurses who had attended educational sessions on pain management in the previous year scored higher in a survey to assess their knowledge of and attitudes towards pain than those who had not. this supports the value of continuing education and the need for the development of pain management programmes which may influence practice.

The changes which were seen could be further supported by the fact there were no alterations in the analgesic prescription regimes in the unit. During both time periods the

nurses had the freedom to administer as much opiate as the patient required to alleviate the pain. Following the educational training programme however they had increased the total amount of opiates administered. The dose given on each administration had also increased as is shown below (Table 3.18). It is also suggested the reinforcement of information related to pain management may have focused their attention on providing adequate pain relief. Education related to pharmacology will have allowed them to make informed choices about the type and amount of analgesia that they could administer. The combination of a reduction in the number of reported episodes of pain and the clear increase in analgesic administration after the study day suggests the training programme had beneficial effects on the control of cardiac pain for patients in the Coronary Care Unit. The increased use of opiates would be beneficial for patients as it would provide improved pain relief, could reduce the perception of pain and anxiety experienced by many patients in the acute stages of myocardial infarction. The increased use of opiates would also have beneficial physiological effects as they could cause peripheral vasodilatation and reduce venous return, thus reducing the workload of the myocardium.

Within CCU at this time the intravenous drug administration was only performed by senior staff nurses, charge nurses or senior charge nurses. The nurse who actually administered the drug may not have been the one who initially assessed the patient's pain nor decided the patient required diamorphine. She may have been the only nurse present in the unit at the time who could administer the diamorphine however. This increase in opiate administration may be an important change in clinical practice. Despite the fact all staff were unable to administer drugs they could still influence the patients' pain management by having assessed their pain and decided it was appropriate for this patient to receive diamorphine.

Table 3.18 Individual Doses Of Diamorphine Administered To Patients With Cardiac Pain

Diamorphine Dose (Mg)	No. of Doses administered pre study day	% Total Doses	No. of doses administered after study day	% Total Doses
1-1.9	4	17	0	0
2-2.9	8	33	5	10
3-3.9	4	17	5	10
4-4.9	0	0	0	0
5	7	29	39	80
>5	1	4	0	0

Prior to the study day it can be seen clearly from these results that staff administered lower doses of opiates. Once more these changes are clearly demonstrated on the following graph (Figure 3.6).

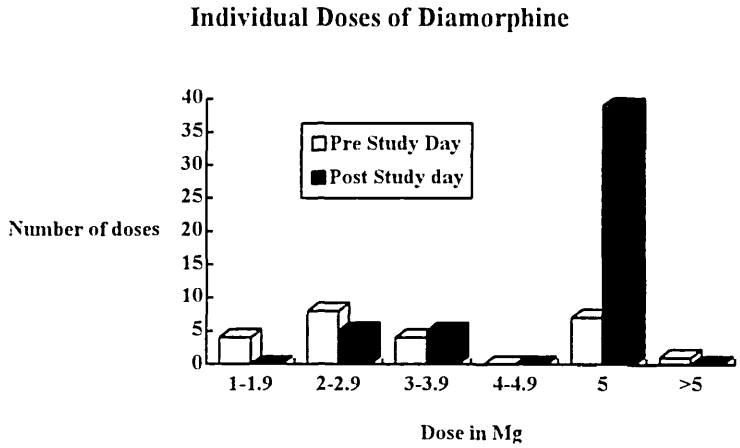


Figure 3.6 Individual Doses of Diamorphine

In 67% of the times drugs were administered the doses given were less than 5mg. After the study day the reverse is true: 80% of the time opiates were administered doses of 5mg were given. This supports the recommendations by Townsend (1988) that pain relief following myocardial infarction was more effective if doses of 5mg were given intravenously. This large shift in the amount of opiates administered within CCU may have resulted from an increased awareness of pain and as the recent study day was still at the forefront of their thoughts.

A change had also occurred in the quality of information the nurses obtained during their verbal interactions with patients after the study day. When the results of the conversations were compared to the results of the questionnaires a great variation was evident in how nurses perceived they assessed pain and how they actually assessed pain. For example when staff were asked if they asked the patient about the quality of their pain i.e. how it feels 100% responded that they always asked patients about this when in fact direct observation revealed 44% asked this before the study day and 51% after the study day. There were increases in the number who asked about pain intensity from 34 to 78% and on many more occasions staff asked about the presence of pain (increase from 49 to 90%). This suggested the staff had at least recognised that even if patients don't report pain this does not necessarily equate with being pain free.

The trend in behaviour change was almost 4 times better than before training but it still did not match their perceived behaviour. The discrepancies shown in the nurses actual behaviour support the work published 15 years ago by Ashworth (1980), who reported

discrepancies between what nurses in intensive therapy/care units believe they do and what they actually do in communicating with their patients.

Analysis of the content of the verbal conversations and comparison to the questionnaires which the staff completed demonstrated clearly that the staffs perceptions of their behaviour does not reflect their behaviour in practice.

The results reported from the questionnaire in this study are similar to those reported by Hoyt and Sparger (1984) and Davies (1987). Despite the surveys being performed in different areas of clinical practice i.e. in an emergency department and in the community care nurses obtained similar information related to the location, quality, intensity, onset and duration of pain. The staff in CCU assessed factors such as the variation in pain, the cause, aggravating and relieving factors and associated symptoms less frequently than had been reported by subjects in the other two studies. The clear variations in reported and actual behaviour demonstrated in this study raise questions as to the accuracy of the questionnaire responses as a reflection of behaviour. It is possible therefore the results obtained in other reported studies reflected how staff think that they assess pain. It is possible the results may actually be better than their clinical practice as they have overestimated the frequency with which they obtain relevant information. The current results suggest that although there was no overall increase in frequency or duration of the interactions between nurses and patients their skills had improved in finding out the information necessary to make a better assessment of pain and thus base their intervention on this information. The variation between perceived and actual behaviour gives rise to the question of the reliability of the information collected by questionnaires.

The introduction of the assessment tool and chart for documentation of the patient's pain may have contributed in part to the altered behaviour. This aimed to improve documentation, standardise staff practice of assessing pain and improve communication between the patient, nursing and medical staff. The improved accuracy and detail in recording a patient's pain experience would also improve the patient's chance of pain control. (Davis, 1988; Swanston et al., 1993). This also follows the recommendations that staff should ask specific structured questions compared to receiving undirected information from patients (Calloway, 1990, Carroll et al., 1993; Hill, 1985; Soafer 1984a). The charts were used for 2 months for every patient and then evaluated, redesigned and replaced with the current pain assessment tool and charts (Appendix V and VI). These tools were then adapted as the standard method for the recording and documentation of pain assessment in CCU. Their continued use resulted in a consistent approach to pain assessment and reduced the variability in staff behaviour within the ward environment in which a comparative

study of two methods of drug administration was to be performed. This study will now be described in chapter 4.

CHAPTER 4.

Patient Controlled Analgesia (PCA) Versus Nurse Controlled Analgesia (NCA): An Evaluation Of Diamorphine Administered Following Myocardial Infarction.

4.0 Introduction

4.0.1 Myocardial Infarction.

Myocardial infarction (MI) refers to necrosis of the myocardial cells caused by a cessation in their blood supply. It is usually associated with an occlusion in the coronary arteries by a thrombus superimposed on an atherosclerotic plaque (Lancet, 1985). The classic history of acute myocardial infarction (AMI) is retrosternal or precordial discomfort described as aching, burning, crushing or heavy (Maseri et al., 1992; Maseri, 1983). The discomfort often radiates over the anterior surface of the chest and frequently into the left or both arms. A common feature of pain in the chest caused by cardiac ischaemia is the presence of a retrosternal component. Patients often describe their pain with a clenched fist (Levines Sign) pointing to their chest.

Myocardial infarction has typically been diagnosed on the basis of the triad of clinical history in particular the presence of chest pain, electrocardiographic (ECG) changes and elevated plasma enzyme activity. Classically if two of these three criteria are present, myocardial infarction is usually considered definite (Rowley et al., 1981).

Although MI can occur in the absence of chest pain in approximately 23% of cases (Margolis et al., 1973, Kunta et al., 1992) often in the elderly and diabetic patients (Devkumar et al., 1991; Nielsen et al., 1991) it is generally the most common symptom and the reason people seek medical assistance (Hunt et al., 1977). Chest pain is not unique to ischaemic heart disease therefore it may be important to differentiate ischaemia or myocardial infarction from other causes of chest pain (Galan et al., 1985).

4.0.2 Diagnosis of Myocardial Infarction

The electrocardiograph is sufficiently sensitive for detecting myocardial ischaemia and infarction. The diagnostic serial ECG changes consist of ST segment elevation with the development of inverted T waves and the evolution of abnormal Q waves. The presence of abnormal Q waves are specific for MI however often they do not develop for on average 8-12 hours from the onset of symptoms but in some cases may take up to 24 hours to develop therefore they are not helpful in the acute situation.

Following MI the serum levels of cardiac enzymes will rise. Elevation may not only confirm the diagnosis of MI but may give some indication of the size of the myocardial

infarction. The most commonly measured enzymes are creatinine phosphokinase (CK) lactate dehydrogenase (LDH) and glutamic oxalocetic transaminase (SGOT). The timing and release of their peaks in relation to chest pain are also of importance. These enzymes are not cardiospecific and may be released from other tissues in response to different stimuli. Isoenzymes of LDH and CK may be used as cardiospecific enzymes. CK is found in high concentrations in both skeletal and cardiac muscle and is also present in the brain. Its estimation is the most sensitive single enzyme assay for detecting myocardial infarction (being positive in over 90% of cases). Serum levels rise within 4-8 hours following myocardial infarction, peak at 24 hours and return to normal after approximately five days. CK is composed of two subunits M (muscle) and B (brain) which can be linked together as MM, BB or MB. The CK-MB isoenzyme is of greatest diagnostic importance as it is virtually only found in the heart. The levels of CK-MB reduce to normal after approximately 72 hours. It is due to the specificity of this enzyme that it is used for the diagnosis of myocardial infarction in CCU.

4.0.3 The Management of Chest Pain in MI

The treatment of chest pain in myocardial infarction is an essential part of the patient's management within a coronary care unit. Narcotic analgesics are the usual treatment in many hospitals. The most commonly used are morphine, pethidine, pentazocine, methadone and diamorphine. In recent years additional drugs have been used for pain relief in MI including agents to relieve ischaemia; thrombolytic agents, intravenous GTN and beta blockers. There is evidence to suggest drugs limiting ischaemic damage may also reduce pain. Alternative agents such as nitrous oxide (Kerr et al., 1975) and levomeprazine (Davidsen et al 1979) have been tried although none of these have gained general acceptance. Morphine and diamorphine are still the most commonly used.

Chest pain is the most obvious clinical marker in the acute phase of a myocardial infarction. Rapid and effective management of pain in acute MI is necessary to prevent detrimental systemic circulatory effects including an increase in blood pressure, heart rate and stroke volume. These changes may adversely effect the patient by disrupting the balance between myocardial oxygen supply and the metabolic demand of the myocardium which may result in the extension of infarction (Herlitz et al., 1989; Bonica, 1987). Persistent unrelieved pain can initiate pathophysiological effects causing catecholamine release and an increased workload on an already compromised coronary circulation (Bonica, 1987). Severe pain is associated with a higher mortality rate and an increased incidence of ventricular fibrillation. It has been suggested that many patients do not achieve satisfactory pain relief after the administration of morphine and that narcotics rarely

provide complete pain relief (Hayes et al., 1979, Scott and Orr, 1967). A study by Bondestram et al., (1987) found many patients were not free of pain in their first 24 hours in CCU. A recent report found less than half of the 20 patients studied received adequate pain relief within 30 minutes of analgesic administration and 80% of the patients felt they had never been painfree during their stay in CCU (Willets, 1989). Patients may also experience intense fear and anxiety which exacerbates the hypothalamic stress response resulting in increased blood viscosity, fibrin deposition and platelet aggregation which may further reduce blood flow and oxygen to the myocardium (Bonica, 1987). Continuing pain may exacerbate anxiety, sleeplessness and loss of control which may inhibit recovery.

The pain experienced after myocardial infarction is variable and difficult to predict. The typical clinical signs which suggest that the chest pain may be myocardial in origin include the sensations of squeezing, stabbing, pressing or crushing. Radiation to or localisation in the neck, jaw, back, shoulders or arms can occur and the pain is often associated with nausea, vomiting, sweating and shortness of breath. Hyperactivity of the autonomic nervous system may cause tachycardia, diaphoresis or bradycardia. The pain is typically unrelieved by rest or nitrates and may last for more than 15 minutes (Bondestram et al., 1987; Thompson et al., 1994a; Herlitz et al., 1984b).

The intensity of the patients pain tends to decrease over the first 12 hours after onset with the most rapid reduction within the first 4 hours (Herlitz et al., 1986b). The time lag from drug administration to optimal relief of pain has been difficult to assess. Delays of up to 20 minutes after IV administration of analgesics and up to 90 minutes following intramuscular administration have been reported (Todres, 1971; Alderman, 1974).

Inadequate pain management has also been attributed to inadequate drug prescription regimes and knowledge of pharmacological properties of narcotic agents (Brockopp et al., 1993, Marks and Sacher 1977, McCaffery 1992, Seers 1987, White 1985). There is little known about the optimal doses of narcotic analgesics in acute MI. A study by The International Collaborative Study Group (1984) reported adequate pain relief in only 61% of patients admitted to a CCU who received 5 mg of diamorphine in contrast to only 21% of those who received only 2.5 mg diamorphine. Most patients who received the lower dose required additional opiates for effective relief. Within CCU prescribing practice allowed the administration of intravenous diamorphine 2.5 to 5mg as required for chest pain. This policy prevented the restraint in prescription often seen by scripts of 'intravenous diamorphine 2.5 - 5mg 4-6 hourly for pain' in other clinical settings. Reports in the literature suggest even when adequate prescription regimes exist staff often administer even less than the prescribed dose of drug (Marks and Sacher 1973). The

knowledge deficits found in health care professionals are exacerbated by lack of education related to pain and its management in training curricula (Ferrell et al., 1992, Mather and Mackie, 1983). In addition a review of textbooks used since 1985 revealed that of 14 books only one correctly identified opiate addiction. The authors recommended the use of the American pain |Society 'Guidelines for analgesic use' until texts can be reviewed to include the correct information (Ferrell et al, 1992).

Attempts to improve pain control until the mid 1980's were based on the development of new analgesic agents. The emphasis has now changed to creating alternative methods of drug administration; for example Patient Controlled Analgesia (Graves et al., 1983). Patient Controlled Analgesia (PCA) was developed in the late 1960's as an alternative method of drug administration (Sechzer, 1968). It has been established as a valuable method of pain relief in many clinical settings (Chapter 1).

PCA systems consist of an infusion pump electronically connected to a timing device, which the patient triggers by pressing a hand held button. When a successful demand is made the timer is programmed to prevent the additional administration of medication until a specified time period has elapsed. This lockout interval prevents additional doses of the drug being given thus avoiding overdose and providing time to allow the first dose to exert its maximal effects.

PCA has several advantages over conventional therapy. It allows immediate accessibility to analgesia avoiding the delays which can occur with conventional administration methods as discussed previously in chapter 1, section 1.14. The amount of analgesia can be tailored to meet the individual's needs. Small increments of the drug avoid wide plasma concentration fluctuations allowing near optimal levels of analgesia with a minimum of side effects. The perceived control the patients have over their pain relief may reduce anxiety and thus minimise their pain experience (McCaffery, 1983). The dependence of patients on nursing staff is reduced and this may help to restore their confidence. In general patients have responded favourably to PCA and have reported increased quality of analgesia and less side effects (Bast et al., 1986).

It is possible therefore that PCA may offer improved pain relief for patients with cardiac pain. Although its use in this situation has been previously reported in a small study (Eltringham et al., 1983), no direct comparison was made between the administration of diamorphine by nursing staff and self administration using a PCA system. The work proposed therefore was to evaluate PCA in the management of chest pain following acute myocardial infarction and to establish whether the administration of drugs in this way was

any different from the administration of intravenous bolus doses by nursing staff who had been educated in the management of pain.

4.1 Aim of Study

The aim of this study was to assess the effect of diamorphine administered via a PCA system in comparison to the effect of diamorphine administered via intravenous bolus injection in the management of chest pain following myocardial infarction within the first 48 hours. It was hypothesised that the improved analgesic effect, the immediate accessibility to analgesia and the increased sense of control associated with this method of drug administration would reduce pain experienced following myocardial infarction, in comparison to a control group who received diamorphine given by the nursing staff via intravenous bolus injection.

Although the main part of the study was conducted using quantitative measures, qualitative data were also obtained by asking patients about their experience of pain and its management following their discharge from CCU.

4.2 Method

4.2.1 Setting

The setting for the study was a purpose built, nine bedded, Coronary Care Unit within a large teaching hospital, Ninewells Hospital and Medical School, Dundee.

4.2.2. Subjects

The study was based on an experimental design with a total sample size of 60 patients. All patients admitted to CCU during the specified study period from August 1992 to March 1993 with a history of chest pain and a suspected diagnosis of acute myocardial infarction were considered for entry into the trial. The study population included 41 male and 19 female patients aged between 21 and 80 who experienced chest pain requiring opiate administration while in coronary care.

Patients meeting the following criteria were excluded from the study:

1) Patients with manifest cardiac insufficiency in particular cardiogenic shock or severe heart failure.

2) Patients with abnormal laboratory findings especially evidence of renal or hepatic failure

3) Patients who were unable to comply with the study procedure due to mental or physical disability

4) Patients with a known history of drug abuse

5) Patients with known opiate sensitivity

The first two were included in order to exclude patients whose condition contraindicated the use of diamorphine. Patients belonging to the third category i.e. had severe mental and/or physical disability e.g. blindness were excluded as two of the outcome measures involved the use of tools to obtain subjective information. These patients would have required assistance from the researcher which could potentially have introduced bias into the responses. In addition patients who could not operate the PCA system for example due to arthritis or hemiplegia were not included.

4.2.3 Definition of Myocardial Infarction

Myocardial infarction was defined on the accepted triad of clinical history, ECG changes and elevated plasma enzyme activity. The patients reported chest pain of greater than 15 minutes duration unrelieved by rest or nitrates. The admission ECG demonstrated changes consistent with myocardial infarction i.e. ST segment elevation > 0.1 Mv in 2 Standard leads and/or ST segment elevation > 0.2 Mv in precordial leads. The exception to this were however instances when bundle branch block shown on the ECG made interpretation of the ST segment impossible. The third factor was positive clinical biochemistry with elevation in serum Creatinine Kinase > 150 units/litre. Within clinical practice a positive diagnosis of myocardial infarction is accepted when two of the three criteria are met.

4.2.4 Randomisation

Conventional experimental design usually requires random selection of subjects from a target population. This is frequently not possible in the hospital environment within a reasonable data collection period. In addition, due to the unpredictable nature of the pain course following myocardial infarction some patients would not have continuing pain therefore would not require any further analgesia and consequently would not be suitable for inclusion in the study. For these reasons all patients who were admitted to CCU with a diagnosis of myocardial infarction were considered for entry into the study. Recruitment

occurred when they had pain requiring opiate administration. At this time they were randomly allocated to either the control group (NCA - group 1) or the experimental group (PCA - group 2).

The method of allocation of patients to one or other of the treatment groups was done using a random numbers table in batches of 10 numbers. The odd numbers were allocated to group one and the even numbers to group two. The group allocations were then placed in sealed envelopes which were numbered chronologically from 1-60. At the time of entry to the study (i.e. when they experienced pain requiring opiate administration) the nurse who had gained the patient's consent to participate in the study opened the next sealed envelope which assigned them to either the PCA group or the control group and allocated the patient a study number.

The nurses who participated in this study were a convenience sample of staff employed in CCU at the time. It was accepted by the researcher the design could have been improved by randomly allocating nursing staff to deliver care to patients as contact with the nurse could have an influence on the patient's pain management. Random allocation of staff to patients would have been the best way to control for individual differences. The shift system and workload of the unit would prohibit this in practice. The nursing staff had changed from working an eight hour shift system to a 12 hour shift system. In an attempt to provide continuity of care and evenly distribute the workload the patients were allocated on a daily basis. The action which was taken therefore was to train staff to minimise individual differences.

Demographic data were collected. Analgesia and any drug therapy taken and/or given prior to admission was also recorded.

Patients who were assigned to the PCA group immediately on entry to the study were given an intravenous injection of diamorphine titrated to individual requirements until a pain free state is reached. The patient was then connected to the Graseby PCA device and the pump was programmed to deliver a preset bolus dose of diamorphine 1 mg with a lockout interval of 3 minutes. Diamorphine was received via the PCA pump for a period of 48 hours following entry into the study. Further diamorphine was then self administered by the patient using the PCA system as required.

Patients assigned to the control group received an intravenous injection of diamorphine administered by the nursing staff. This was also titrated to individual requirements until a pain free state is reached. Further diamorphine was administered by the nursing staff as

required. This therefore allowed the nursing staff to administer as much analgesia as often as necessary to alleviate the patient's pain. The amount administered was therefore dependant on the nurse's evaluation of its effects. Recording of analgesic administration occurred for 48 hours to make a comparison with the experimental group.

4.2.5 Ethical Considerations

Before patients were enrolled all pertinent aspects of the study were explained to them and their consent obtained. The potential of problems arising because patients may be acutely unwell on admission to CCU was recognised. The issue of when informed consent should be obtained was considered. It was possible that patients may still have been in pain on admission or they may have had opiates prior to their admission which could influence their understanding of the study implications. Similarly it did not seem appropriate to wait until the pain commenced to recruit the patients. It was decided to ask patients whether they would consider participating as soon as possible after their admission. It was reinforced later by the staff that they did not have to participate if they did not want to and this would not prejudice their care. Throughout the period of recruitment two patients did decide that they did not wish to participate in the study. Their choice was respected and care given as normal. It was not always feasible for written consent to be obtained immediately prior to the patient's recruitment. For this reason where it is not possible to obtain written consent then witnessed verbal consent was considered acceptable. The consent form was then signed by the patient at a more appropriate time. This was however only necessary on two occasions and the patients signed the consent forms within the first 24 hours of their admission. The fact that many patients on admission to the unit may still be suffering a certain degree of pain meant it was impractical to talk through the detailed information sheet. A shortened version was produced in order to provide enough information for the patients to make an informed decision as to whether to participate or not (Appendix XVII).

The patient was informed of their right to withdraw their consent to participate in the study at any time without prejudice to their care. The patients were not obliged to state their reasons for withdrawal. Guidelines were also produced to assist in the withdrawal of patients from the study, if at any time in the opinion of the medical and nursing staff it was necessary, for either of the following reasons: if the patient develops serious side effects or the patient develops a concurrent condition. All withdrawals were documented.

Ethical committee approval from Tayside Health Board Committee on Medical Ethics was granted in October 1990. Since that time alterations in practice in CCU required some alterations in the protocol and these were resubmitted to the Ethical Committee in June 1992. Their response necessitated further adjustment and enquiries. Final approval was granted as shown in August 1992 (Appendices XVIII and XIX).

4.2.6 Research Hypotheses

The study described in this chapter attempted to test the following hypotheses:

1. Patients receiving PCA will experience less pain in the 48 hours following entry into the study.

2. There will be a difference in total analgesic consumption between the PCA and Control group in this 48 hour period

3. There will be a difference in urinary catecholamine secretion with lower levels in the PCA group

4. Patients receiving PCA will express increased satisfaction with their pain management than those receiving conventional analgesia.

The hypotheses were tested by comparing four outcome measures. The first hypothesis was tested by comparing subjective pain ratings. The patients' pain levels were assessed throughout their stay in CCU using a standard Numerical Rating Scale as previously described in section 1.9.5.

The second hypothesis was tested by recording the amount of narcotic analgesia received by the patients after 24 and 48 hours. Any additional analgesia required was noted e.g. non-steroidal anti inflammatory drugs.

The third hypothesis was tested by the measurement of urinary catecholamines. The specific measurement of adrenaline, noradrenaline and dopamine secreted in the urine was carried out by completing two consecutive 24 hour urine collections while the patient was in CCU. One further 24 hour urine collection was completed on the 5th day of the patients admission, within the general medical ward, to make a comparison with the acute situation.

In an attempt to obtain information related to the patient's pain experience and the patient's perception of care following myocardial infarction a questionnaire was designed which the patient was asked to complete following the patient's transfer from CCU but prior to their discharge from hospital (Appendices VII and VIII).

A protocol of the study procedure was produced for reference by nursing and medical staff and situated in the ward (Appendix XX). Each member of nursing and medical staff

working in CCU throughout the duration of the study was seen either individually or in a group and the study procedures explained to them. Each member of staff also received a personal copy of the study protocol. The opportunity was given for staff to ask questions.

In service training was provided by the representative from Graseby to ensure all staff were familiar and competent in the programming and use of the PCA pump. This training was reinforced by the researcher for a two week period prior to the recruitment of the first patient to ensure both day and night staff were competent in establishing the PCA infusion. The researcher was also carrying a radio pager for the duration of the recruitment period and encouraged staff to contact her at any time with any queries they may have.

4.2.7 Pain Assessment Tools

The numerical rating scale (NRS) was chosen for the measurement of the intensity of chest pain. The numerical rating scale, a tool frequently used in the assessment of pain, consists of a horizontal line with 10 equal divisions ranging from 0 to 10. In addition it had anchors at each end of 'no pain' and 'the worst possible pain'. The subject was asked to rate their pain intensity by giving a score from 0 to 10 as to how their pain was now.

The NRS provides information on only one aspect of the patient's pain experience, pain intensity. To assist in the description of pain a tool was developed to provide information related to the quality and the location of the patient's pain. A chart which contained pictures of people with shaded areas to represent the common distribution of ischaemic pain was produced. This was adapted from Hammermeister (1990). Each diagram was labelled with a letter from A-H and the picture most closely representing the location of their pain was chosen and coded on the chart. A full body chart was also included on the tool to allow the description of pain other than that from a cardiac origin e.g. back pain, knee pain, headache etc. The chart also contained a list of common descriptive terms used by cardiac patients as some patients had difficulty describing their pain (Berker et al., 1990; Gaston-Johnansson et al., 1991) Pain assessments were made every hour, and before and after every episode of pain reported. Patients who were asleep were not be wakened. This resulted in a varied amount of pain measures for each patient but it was stressed the importance of adequate rest and sleep in the recovery period. Pain assessments were recorded at the time of their occurrence to avoid retrospective recall which could influence the patient's report of pain.

4.2.8 Analgesic Consumption

The total amount of diamorphine received by the patients was calculated after 24 and 48 hours for the experimental and control groups. The use of additional analgesia and intravenous nitrates was recorded.

4.2.9 Urinary Catecholamine Measurement

Three 24 hour urine collections were made whilst the patient was in hospital as described in Chapter 2 and section 2.5.1. They were analysed to measure the levels of free circulating adrenaline, noradreneline and dopamine. Measurements of the mean concentration of each catecholamine were made for the control and PCA groups.

4.2.10 Questionnaire

In order to explore the patients' perception of their experience of pain following myocardial infarction and its subsequent treatment, a questionnaire was designed. The development of this tool resulted in the production of two instruments; the first a 34 item questionnaire which was given to the subjects in the control group and the second a 40 item questionnaire which was given to the experimental group. Questions 1 to 19 were common to both groups after which the questions diverged but could be matched for responses. In the questionnaire administered to the experimental group items 34-40 were specifically related to the use of PCA. The information obtained by these questionnaires related to the subjects experience before admission to CCU, their experience of pain and its management within CCU, their expectations of pain relief and satisfaction with pain management.

The questionnaires contained a mixture of both open and closed ended questions as described in Chapter 2 section 2.5.4. The questionnaires were given to the patients on day 5 of their admission while they were on the general medical ward. Each questionnaire was then collected by the researcher the following day, checked for completeness and the opportunity given to patients to discuss any other aspects of their experience. The use of this questionnaire allowed presentation of the questions in a consistent manner with less opportunity for bias than in an interview.

4.3 Main Study

The pilot studies described in chapter 2, section 2.5.2 and 2.5.5 had allowed refinement of the research tools to improve the methods of data collection.

4.3.1 Patient Characteristics

In previous research age and sex have been identified as having a possible effect on pain (Herr, 1991, Kuhn 1990). It was therefore thought important to consider these variables in the research study and analysis of results. The random allocation of subjects to the treatment groups resulted in equal proportions of men and women in each study group and there was no difference in the mean age of both groups. All patients admitted to CCU with a history of suspected myocardial infarction were considered for entry to the study. Between the groups it was subsequently found that 1 patient in the control group may not have had a definite MI. This patient was transferred to a surgical ward with a diagnosis of suspected pancreatitis. Additional variables noted were weight, previous history of heart disease/myocardial infarction, smoking status and whether following thrombolysis they had reperfused their myocardium.

It was recognised that patient's previous pain experiences may influence their behaviour therefore this was considered in the analysis of the data. The changes in the management of myocardial infarction encouraging early thrombolysis to restore patency of the artery and thus relieve ischaemia may have had a potential effect on pain. This possible influence was therefore taken into consideration in the analysis.

4.3.2 Study Procedure

4.3.2.1 Negotiating Access

All staff, both nursing and medical, who would be working in the unit were contacted by the researcher and the study procedure explained. Patients who were admitted to CCU were usually discharged after approximately 48 hours to a general medical ward to complete their recovery process before their discharge home. Since it was necessary to visit the patients during their stay in the general medical wards, the nursing staff employed on the general medical floor were also contacted and invited to attend meetings with the researcher to explain the background to the study with specific emphasis on their contribution to data collection. This facilitated access of the researcher to the six general medical wards involved. Information was also circulated to each of the consultants on the

medical floor explaining the background and requesting their co-operation in the involvement of patients who would be discharged to their care (Appendix XXI). The researcher also met with the Clinical Nurse manager of the Critical Care Directorate and the Director of Nursing services to discuss the study and obtain their consent to carry out this research study.

4.3.2.2 Conduct of the Study

All patients admitted to CCU with a history of suspected acute myocardial infarction who met the inclusion criteria were identified. As soon as possible after their admission they were approached by the researcher and the study described to them. They were asked at that time whether if they developed further chest pain they would consider entering into the study. A general explanation of the two treatment options was given. When any patient who had agreed to participate in the study developed chest pain requiring opiate administration the appropriate randomisation envelope was selected by the nurse responsible for the patient's care. Having identified their treatment group further explanation was given as necessary. Since patients are admitted with acute myocardial infarction 24 hours a day it was impossible for the researcher to be present in the unit at all times. In the absence of the researcher a member of nursing staff requested the patients agreement to participate in the study. All staff had been instructed in the method of recruitment and a short example of the invitation was produced for the staff to ensure consistency of the information given to patients (see Appendix XVII). Each patient received an information sheet and written informed consent was obtained as described in section 4.2.5. and Appendix XXII The group to which the patient had been assigned was documented on the patient's nursing kardex and on their pain charts.

Patients in the two groups were then given intravenous diamorphine for chest pain as described in section 4.2.4. A separate sheet was produced for the prescription of PCA. (See Appendix XXIII). The routine prescription of diamorphine was also included in the kardex to allow the initial administration of a bolus injection of opiates to allow the patient to reach a painfree state prior to the commencement of PCA, and also to allow the additional administration of opiates if the patient's pain was not controlled using PCA. The PCA infusion was connected to the intravenous cannula via a cardiff valve, a one way valve to prevent the back flow of diamorphine into any other intravenous infusion.

Day 1

Within the first 24 hours pain scores were recorded for each of the two groups in the following manner. In the control group pain was rated by patients before and after every episode of reported pain. At the same time the nurse who was assessing the patients pain, immediately before asking the patient to rate his pain using the NRS, rated the patients pain using the same numerical rating scale. This allowed a comparison of nurses' and patients' ratings of pain. In the PCA group the same procedure was followed wherever possible. If the nurse had not been present at the time the patient had had pain and used the PCA pump, when she entered the room to carry out the hourly infusion check she asked if the patient had any pain at that time. If diamorphine had been self administered within the last hour the patient was asked to score the pain they had at that time. Details of the consumption of diamorphine over the 24 hour period were recorded by the researcher for both groups.

A 24 hour urine collection was commenced to allow the measurement of catecholamines from the time of entry to the study. The techniques used were previously described in chapter 2.5.1.

Day 2

During this time period 24-48 hours the pain ratings by nurses and patients continued as previously described. The consumption of diamorphine was recorded. The urine collection continued for a further 24 hours. The collection of data was stopped after the 48 hour period, but any subsequent treatment required by patients was noted but not included in the analysis.

Day 3

Most patients were discharged from CCU on their 3rd day in hospital to a general medical ward. On their transfer the nurse responsible for their care would also notify the nursing staff in the medical wards of their participation in the pain control study and the staff were given a 24 hour urine collection bottle with the appropriate biochemical forms completed and the date of the next urine collection included. They were also informed that the patients would be visited by the researcher the following day to administer the questionnaire and again the day after for its collection.

Day 4

The researcher visited each of the study patients on the ward, distributed the questionnaire and gave them instructions as to how to complete it. A brief covering letter was given to the patients. They were informed that the researcher would return sometime the following day for the collection of this form. All patients were asked to complete the questionnaire themselves as it was important the data reflected their personal opinions and experiences and not those of their relatives and or friends. If they had any further questions they could ask them at the time. They were also informed that their third urine collection would commence the following morning for a further 24 hours. This reinforced the study protocol and increased the likely success of the third urine collection being completed.

Day 5

The researcher visited the patients on the 5th day of their admission at a convenient time for the patient, the medical ward staff and the researcher. The timing of the visits had to be before 3 p.m. or after 8 p.m. as it proved practically difficult to complete this exercise during the hospital visiting hours. Most wards encouraged patients to rest after lunch, when the curtains were closed and the lights were dimmed. This therefore caused difficulty gaining access to the patients at this time. During the meeting the researcher checked through the questionnaire and the patients' responses to ensure completeness of the data. No attempt was made to alter the patient responses but some patients did ask for clarification on a particular point after which they completed their responses. The opportunity was given for the patients to express any additional feelings, whether positive or negative, related to their care within the hospital. These were noted by the researcher.

4.3.3 Data analysis

The data required was recorded on the patients charts, a demographic data sheet (Appendix XXIV), a log book and questionnaires used purely for the study. A coding system was designed by the researcher. The response to each item was coded, then the code was transferred into the computer by the researcher for analysis.

The data was analysed using the Minitab statistical package on an IBM personal computer or the mainframe network at the University of Abertay, Dundee. When data were missing or incomplete the variable was coded as missing. For this reason N= X may vary slightly

within the reported results. All patients who did not have completed data sets were not automatically withdrawn from the analysis as it was thought this would lead to the loss of important information. The missing data was identified and thought not to affect the overall results materially.

Demographic data were cross tabulated and compared using an appropriate test. The data for each of the outcome measures were also analysed and in the analysis of all data if they exhibited a reasonably normal distribution a parametric test was used, otherwise the appropriate non parametric test was used. Observation of the results showed the distribution of much of the data was skewed, therefore it was often more appropriate to measure the median result rather than the mean. The significance level was set at 5% as this is the lowest level of probability which is acceptable in scientific experiments and clinical research, i.e. that there is a one in twenty chance of incorrectly rejecting the null hypothesis given that it is true. Probability of less than 5% would allow the result to be reported with a higher degree of confidence.

In the analysis of the questionnaires the data from each item were coded, entered into the computer and analysed. Since some of the items were open questions a variety of responses were obtained. The researcher attempted to detect any common responses or themes which may have arisen. A selection of response categories were devised and the data were then coded within these categories. It was recognised within this analysis, that the possibility of subjective bias may be introduced therefore an independent coder who was a graduate nurse with experience of cardiac nursing also coded the data according to the categories identified and it was found after comparison 86% agreement was achieved.

4.4 RESULTS

The following section describes the results of the comparative study of two methods of drug administration for patients who had chest pain associated with myocardial infarction within a coronary care unit. This study was completed to determine if the administration of diamorphine via a PCA system was any better or worse than the administration of diamorphine as an intravenous bolus dose by the nurse in controlling pain after MI. A total of 60 patients entered into the study with 30 randomly assigned to the control group, who received intravenous diamorphine administered by the nursing staff, and 30 to PCA who could self administer their diamorphine. The results are reported in 3 sections; demographic data, comparison of the objective measures and the questionnaire analysis. NB In some tables below there are missing values.

4.4.1 Demographic Characteristics

Prior to testing of the study hypotheses, analysis of the baseline characteristics of the subjects within the two groups were carried out. This provided information on the characteristics of the sample population. Tests of difference between the two groups were carried out on each of the variables (4.4.2 - 4.4.12). There were no significant differences in the baseline measures found between the two groups except where reported. For full details of the analysis see appendix XXV.

4.4.2 The Age and Gender Distribution

The age and gender distribution of the subjects is demonstrated in Tables 4.1 and 4.2.

Table 4.1 Age and Gender Distribution of the Study Population

Age Group	Males Control	Males PCA	Females Control	Females PCA	Total N
< 60	9	8	5	4	26
≥ 60	12	12	4	6	34
Total N	21	20	9	10	

There were approximately twice as many men as women in the study groups and a higher proportion of subjects were in the older age group (aged 60 and over) within both groups.

4.4.3 Mean Age of PCA and Control Group

The mean age of the two groups is represented in the table below.

Table 4.2. Mean Age of Study Population

Age	PCA	Control
Mean	61.37	60.03
SD	9.17	9.70

4.4.4. Distribution of Subjects by Gender

Table 4.3 Distribution of Subjects by Gender

Sex	PCA	Control
Males	21 (20.5)	20 (20.5)
Females	9 (9.5)	10 (9.5)

* Figures within parentheses are expected frequencies.

This demonstrates there were approximately twice as many men as women in both groups.

4.4.5 Comparison of Subjects by Weight

Table 4.4 Comparison Of Subjects by Weight

	Mean weight in KG (SD)	
	PCA	Control
Males	79.06 (11.07)	73.62 (11.59)
Females	62.04 (14.53)	71.06 (13.67)
All	73.88 (14.33)	72.87 (11.81)

The PCA group had a mean weight of 73.88 kg and the control group had a mean weight of 72.87 kg. A two way analysis of variance of weight by sex and study group was carried out. The 2 way ANOVA was done to adjust for the potential differences in weight as a result of an uneven distribution of men to women within the two groups. The test showed not surprisingly a significant difference in the mean weights of men and women ($F(1,43) = 6.45$; $P < 0.05$). Taking this into account there was no significant group effect ($F(1,43) = 0.21$; $P > 0.05$) or interaction between sex and group ($F(1,43) = 0.68$; $P > 0.05$ N.S.).

Additional information was gathered which was thought could possibly influence the patient's pain experience. This included whether the patients had reperfused their myocardium following thrombolytic administration, maximum recorded elevation in cardiac enzymes released which may have influence the extent of the MI. The relevance of these factors and their potential influence on the patients pain experience have previously been discussed in section 1.7 and 4.0.3.

4.4.6 Previous Ischaemic Heart Disease

The groups were then compared for differences in previous ischaemic heart disease (Table 4.5).

Table 4.5 Incidence of Ischaemic Heart Disease in the Study Population

	PCA	Control	All
Previous IHD	12 (10.62)*	10 (11.38)	22
No previous IHD	15 (17.38)	20 (18.62)	35
All	27	30	57

* Figures within parentheses are expected frequencies

Analysis showed there is no significant difference in the incidence of previous ischaemic heart disease between the two groups

4.4.7 Previous Myocardial Infarction

Table 4.6 Incidence of Previous Myocardial Infarction in the Study Population.

	PCA	Control	All
Previous MI	8 (6.28)	5 (6.72)	13
No previous MI	20 (21.72)	25 (23.28)	45
All	28	30	58

* Figures within parentheses are expected frequencies

There is no significant difference in the incidence of previous MI between the study groups.

4.4.8 Cardiac Enzyme Release as Determined by Creatinine Kinase (CK) Elevation.

The groups were compared for differences in the maximum CK levels which were regarded as an indication of the size of myocardial infarction. The histogram overleaf shows the maximum CK levels for each group. A skewed distribution was seen, consequently a non parametric test was used to test for the differences between the PCA and control group.

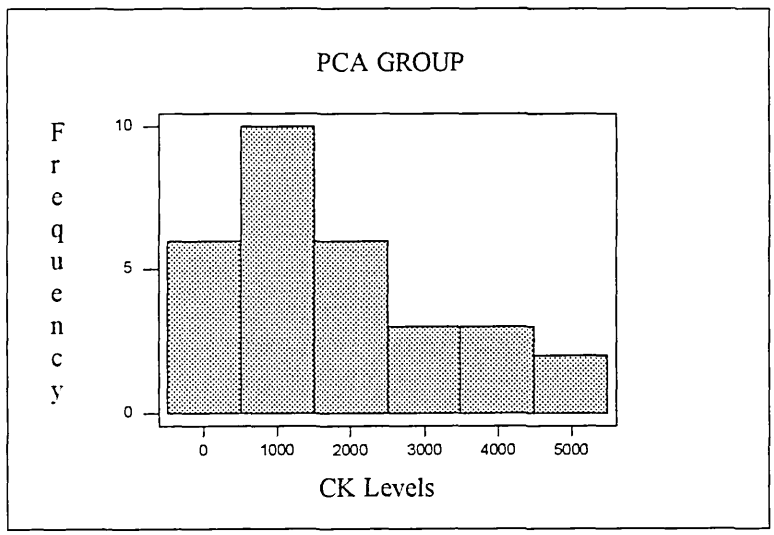


Figure 4.1 Histogram of maximum CK levels PCA group

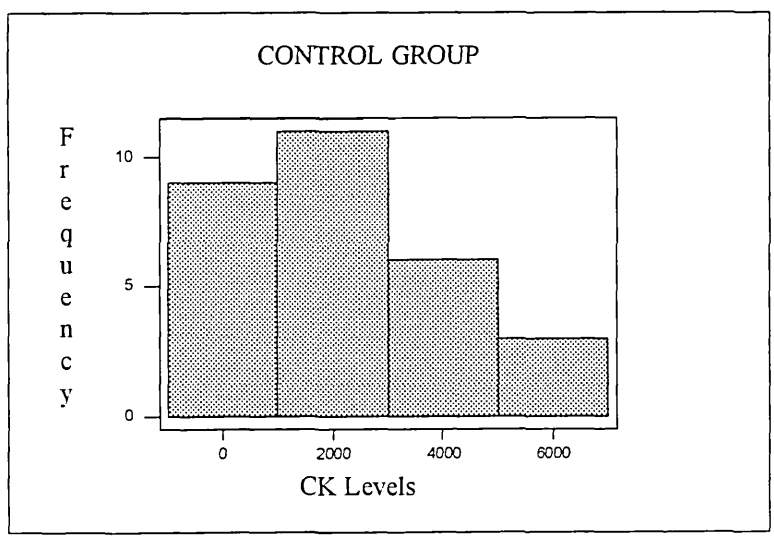


Figure 4.2 Histogram of maximum CK levels control group

The Mann Whitney Test Statistic was not significant at the 5% level showing no significant difference between the medians of the two groups (W =833.5, Z = -1.00; P > 0.05).

4.4.9 Site of Myocardial Infarction

The groups were compared for difference in the site of their myocardial infarction and the results are presented in Table 4.7.

Table 4.7 Site of Myocardial Infarction in the Study population (a)

Site of MI	PCA Group	Control Group	Total
Anterior	10 (9.83)	10 (10.17)	20
Inferior	10 (11.80)	14 (12.20)	24
Posterior	1 (0.49)	0 (0.51)	1
Lateral	1 (0.49)	0 (0.51)	1
Inferolateral	2 (2.46)	3 (2.54)	5
Anterolateral	1 (1.47)	2 (1.53)	3
Other	4 (2.46)	1 (2.54)	5
Total	29 (29.00)	30 (30.00)	59

* Figures within parentheses are expected frequencies

To allow the assumptions of the Chi Square Test to be valid i.e. at least 80% of the expected frequencies greater than 5 and none less than 1, the categories of less common infarct sites were combined (table 4.8)

Table 4.8 Site of Myocardial Infarction in the Study Population (b)

Site of MI	PCA Group	Control Group	Total
Anterior	10 (9.83)	10 (10.17)	20
Inferior	10 (11.80)	14 (12.20)	24
Other	9 (7.37)	6 (7.63)	15
Total	29 (29)	30 (30.00)	59

There was no significant difference between the site of MI in the study groups.

4.4.10 The Incidence of Reperfusion

The groups were also compared for the incidence of reperfusion based on ECG criteria described in previous studies (Hogg et al., 1989; Hogg et al., 1988). The ECG recordings of patients were examined before and after the administration of intravenous streptokinase, the thrombolytic routinely used in CCU, by the researcher to identify reperfusion in accordance with the established criteria of a reduction in ST segment elevation and/or the absence of the development of pathological Q waves. To eliminate bias they were also examined by an independent observer, an experienced research registrar with extensive knowledge of thrombolytic mechanisms. The observer was blind to the study groups of the patient. 100% agreement in the categorisation of whether the subject had reperfused or not was obtained. The results are presented in Table 4.9.

Table 4.9 Incidence of Reperfusion in the Study Groups

	PCA	Control	All
Reperfusion	12 (10.50)	9 (10.50)	21
No reperfusion	14 (15.50)	17 (15.50)	31
All	26 (26.00)	26 (26.00)	52

There was no significant difference in proportion of patients who showed reperfusion in the study groups.

4.4.11 The Patients Current Smoking Status

The patients current smoking status was also recorded and is presented in table 4.10

Table 4.10 Current Smoking Status

	PCA	Control	All
Current Smoker	13	19	32
Ex Smokers: (no of months)			
Stopped <6/12	2	1	3
Stopped >6<12	0	1	1
Stopped >12<24	1	0	1
Stopped > 24	3	7	10
Non smoker	7	2	9
Total	26	30	56

To allow analysis using Chi square the groups were categorised into Current smokers, Ex-Smokers and non smokers Table 4.11

Table 4.11 Smoking Status

	Control	PCA	All
Current Smoker	19 (17.1)	13 (14.9)	32
Ex Smokers:	9 (8.1)	6 (6.9)	15
Non smoker	2 (4.8)	7 (4.21)	9
Total	30	26	56

There was no significant difference between smoking status in the study groups

4.4.12 Pre-Hospital Analgesic Administration

An additional factor that was thought might influence the patient's pain experience was the administration of analgesia pre-admission. On admission it was noted whether the patients had received any opiate analgesia prior to their hospital admission. Twenty one patients in the PCA group and fourteen patients in the control group received opiates before their admission to CCU. This meant that 9 of the PCA group and 16 of the PCA group did not receive opiates. The drugs given are shown in the following tables.

Table 4.12 Administration of Opiates before Admission to CCU

Diamorphine (Mg)	Control N =29	PCA N =29	Total N = 59
2.5	1	2	4
5.0	8*	12	20
> 5 < 10	2	0	2
10	0	2	2
Cyclimorph (Mg)			
10	1	0	1
15	3*	5	8
20	0	1	1

* one patient received both diamorphine and cyclimorph in the control group
**N =58 Data missing for 2 patients

Table 4.13 Patients who Received Opiates Before Admission to CCU.

	Control N=29	PCA N=29	Total N=58
Received opiates	15 (18.5)	22 (18.5)	37
Did not receive opiates	14 (10.5)	7 (10.5)	22

*expected frequencies are shown in the brackets

It can be seen from these tables that patients received variable doses of analgesia before admission to hospital. The alarming fact is despite presenting with an acute MI, 14 of the 29 patients in the control group and seven of the 29 patients in the PCA group received no opiate analgesia prior to their admission to CCU despite having been admitted through the Admission and Emergency department. This resulted in 38% of the patients within the study groups receiving no opiates prior to their arrival in CCU. No significant difference

was found in the number of patients who received opiates before admission to CCU within the control and PCA groups.

4.4.13 Subjective Pain Scores

The results of the experimental and control groups pain ratings, between 0-10 on the numerical rating scale are shown below. Two time periods were measured; from 0-24 hours and from 24-48 hours after the time of entry into the study. The median pain score for each patient was used as there was a skewed distribution of pain scores between the two groups. The median pain scores are presented on the table below (Table 4.14)

Table 4.14 Median Pain Scores

	PCA Group Median Pain Scores N = 27	Control Group Median Pain Scores N = 26
24 Hours	0.00	2.00
24-48 Hours	0	0

This showed the median pain scores of the control group were higher than the PCA group within the first 24 hours. Analysis using a Mann Whitney Test of the median pain scores within the first 24 hours showed a statistically significant difference between the median pain scores of the control and PCA groups (Mann Whitney Test = 867; $P < 0.01$). The results shown on the tables confirm the control group reported higher median pain scores than the PCA group within the first 24 hours. Analysis of the pain scores within the period from 24-48 hours revealed no significant difference in median pain scores between the control and the PCA group (Mann Whitney Test = 331; $P > 0.05$ N.S.).

Thus the first hypothesis that patients receiving PCA will experience less pain in the 48 hours following entry into the study was supported.

The difference between pain ratings on day 1 and day 2 were also calculated. A paired comparison of individuals pain scores (day 1 - day 2) was performed. The results revealed an approximately normal distribution and the difference in mean reduced pain scores between 24 and 48 hours was tested using one way ANOVA.

This showed a significant difference in mean pain scores between the first and second 24 hour period ($F_{1,55} = 6.88$; $P < 0.05$). This suggests over time the intensity of pain experienced associated with myocardial infarction reduced in both groups.

4.4.14 Comparison of Nurses versus Patients Ratings of Pain

Each time a nurse assessed a patient's pain she was asked to rate how she would score their pain on the same 0-10 numerical rating scale. This was done immediately before asking the patient to score their pain. This provided 610 comparisons of nurses and patients ratings of pain. The correlation between the nurses' and patients' pain scores was 0.895. This shows a significant positive agreement between the nurses' and the patients' scores ($P < 0.05$). On 70% of the occasions the nurses rated the pain the same as the patients. On 21% of occasions the nurse underestimated the pain and on 9% of the occasions the nurse overestimated the pain.

Separate t tests were performed for the control and PCA groups to test the hypothesis that the mean difference between the nurses and the patients scores could be zero. If the nurses and patients scores were in agreement, we could expect an average value of zero for the difference. For the control group this hypothesis was rejected $t(198) = 5.66$; $P < 0.01$. For the PCA group this hypothesis was accepted $t(410) = 1.93$; $P > 0.054$. This suggests in the PCA group the nurses assessed pain more accurately. The possible reasons for this will be discussed later in section 4.5.2.

4.4.15 Comparison of Drug Consumption

It is possible that pain scores may be related to diamorphine consumption. It would be expected that those who had more opiates would report a lesser intensity of pain. It was therefore of interest to measure analgesic use for 48 hours post infarction (Table 4.15).

Table 4.15 Diamorphine Consumption following Myocardial Infarction in Control and PCA Groups

Mean Diamorphine consumption in Mg	Control Group	PCA
After 24 Hours (S.D.)	8.60 (7.1)	12.78 (9.25)
After 48 Hours (S.D.)	1.18 (2.36)	4.46 (6.22)
Total after 48 hours (S.D)	9.72 (8.89)	16.65 (15.82)

Both groups received more diamorphine on the first day than on the second. Statistical analysis using one way ANOVA showed no difference between the groups in drug consumption ($F1,58 = 3.15$ $P > 0.05$) within the first 24 hours. Analgesic consumption within the second 24 hours demonstrated the control group used significantly less diamorphine than the PCA group ($F1, 52 = 6.75$, $P < 0.05$). Comparison of the total dose showed a significant difference ($F1, 58 = 4.38$, $P < 0.05$) in the total analgesic consumption with the amount used by the PCA group being higher.

These results support the second hypothesis that there would be a difference in the total analgesic consumption between the PCA and the control group.

Further analysis was done to measure whether there was any relationship between age and opiate requirements. It has previously been suggested that older people will require less opiates. Measures of correlation between age and opiate use were made after 24 and 48 hours. The results in this study did not support this. There was no correlation between age and opiate use (correlation values of 0.105 and 0.048 were found in relation to opiate use after 24 and 48 hours respectively N.S.)

Calculations were also performed to identify any relationship between weight and opiate requirements. It is a commonly held belief that heavier people require more opiates to control pain. This was not supported in this study. A correlation was performed between weight and opiate requirements and it was found that there was no relationship between weight and drug requirement. (correlation values 0.044 and 0.105 with 24 and 48 hour opiate consumption N.S.).

4.4.16 Duration of Pain

The duration of pain was measured and recorded as the time from entry to the study to the last recorded administration of analgesia. The median values were 492 and 1678 minutes in the Control group and PCA group respectively. The median values were compared using a Mann Whitney Test (MW 571.0, $P<0.05$)

4.4.17 Catecholamine Measurements

Three free circulating catecholamines were measured following MI; Noradrenaline, adrenaline and dopamine. The mean concentrations for each of the catecholamines measured is shown in tables 4.16, 4.17 and 4.18 respectively.

Table 4.16 Mean Concentration of Noradrenaline Excretion Following Myocardial Infarction; Days 1,2 and 5.

	Mean Conc Day 1	Mean Conc Day 2	Mean Conc Day 5
Control (S.D.)	0.455 (0.336)	0.341 (0.266)	0.421 (0.192)
PCA (S.D.)	0.747 (0.563)	0.482 (0.323)	0.410 (0.242)

Table 4.17 Mean Concentration of Adrenaline Excretion Following Myocardial Infarction; Days 1,2 and 5.

	Mean Conc Day 1	Mean Conc Day 2	Mean Conc Day 5
Control (S.D.)	0.074 (0.096)	0.025 (0.048)	0.044 (0.021)
PCA (S.D.)	0.133 (0.135)	0.047 (0.066)	0.018 (0.021)

Table 4.18 Mean Concentration of Dopamine Excretion Following Myocardial Infarction; days 1,2 and 5

	Mean Conc Day 1	Mean Conc Day 2	Mean Conc Day 5
Control (S.D.)	1.595 (1.052)	1.586 (1.307)	1.576 (1.983)
PCA (S.D.)	2.001 (1.317)	1.441 (0.858)	1.779 (1.902)

These results can be seen more clearly in the following graphic representations (Figure 4.3 -4.5).

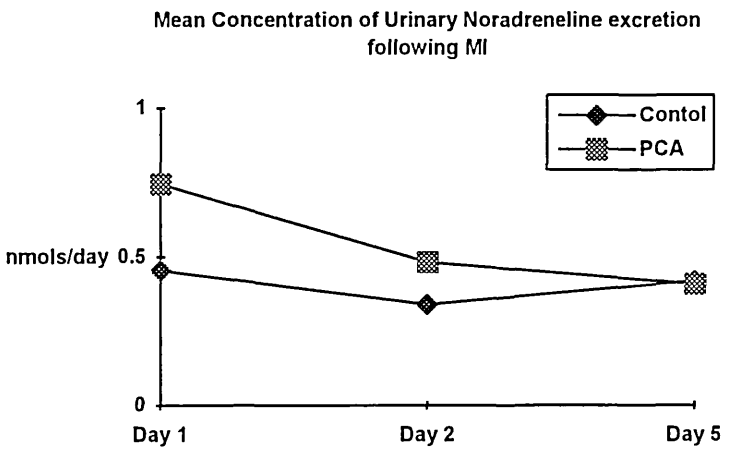


Figure 4.3 Mean Concentration of Urinary Noradrenaline Post MI Days 1,2 and 5

The concentration of noradrenaline appeared higher in the PCA group than in the control group on day 1. A one-way analysis of variance of noradrenaline secretion at 24 hours showed a statistically significant difference ($P<0.05$) but no difference was seen on day 2 or day 5. The differences in noradrenaline levels (day 1) required an analysis of covariance to take into account the possible confounding effect of the size of the infarct. The size of MI was estimated by maximum CK elevation. therefore an analysis of covariance was used to control for CK effects and showed the relationship between the maximum CK elevation and noradrenaline secretion was significant ($F1,51) =5.18$; $P<.0.05$. Taking this effect into account there was no difference seen in noradrenaline secretion between the two groups ($F1,51) = 3.02$; $P> 0.05$.

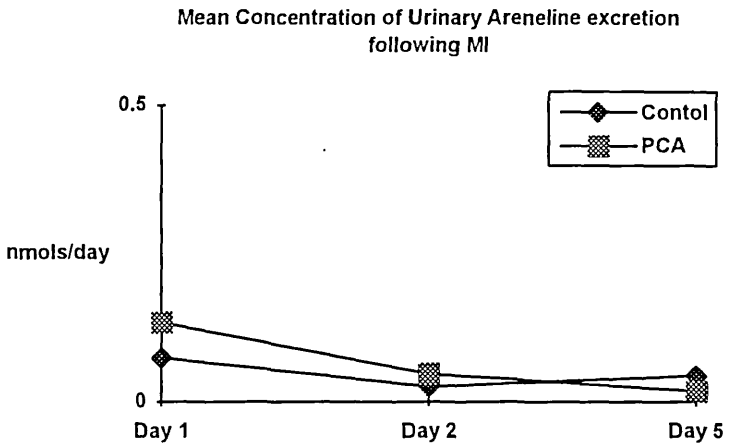


Figure 4.4 Mean Concentration of Urinary Adrenaline Following MI

Analysis of covariance of adrenaline levels when maximum CK levels were considered showed a highly significant effect on adrenaline secretion ($F1,51)=10.83$; $P<0.01$) but there is no difference in the study group. MI size may therefore be an influential factor on the secretion of adrenaline post MI.

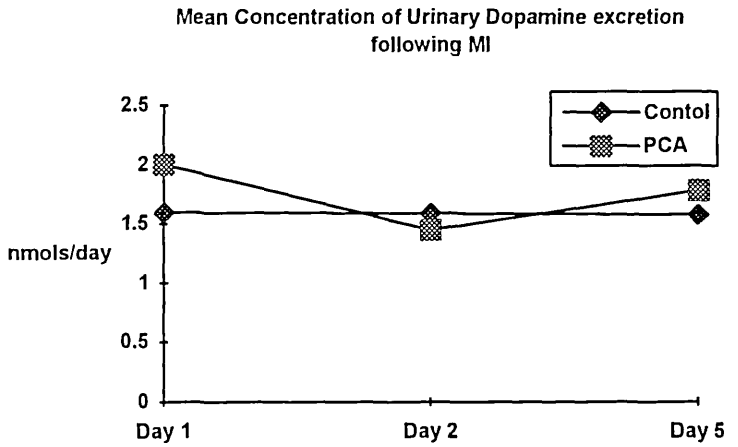


Figure 4.5 Mean Concentration of Urinary Dopamine Following MI

Similar measurements and analysis were made for dopamine (Table 4.18, Figure 4.5) and revealed that dopamine was not related to the maximum CK levels. Analysis of Covariance on day 1 showed no significant difference ($F1,51 = 0$; $P> 0.05$) nor for the study group ($F1,51 = 1.29$; $P> 0.05$). The results for day 2 showed no significant difference ($F1,47 = 0.01$; $P > 0.05$) nor for the effect of study group ($F1,47 = 0.49$; $P > 0.05$). Both adrenaline and noradrenaline appear to be related to maximum CK and adreneline levels were also seen to be related to CK levels after 24 hours. Adreneline may therefore be a useful indirect measure of infarct size. In contrast dopamine secretion was not affected by CK levels.

These results do not support the third hypothesis that there would be a difference in catecholamine secretion between the control and PCA groups. No relationship was seen in secretion of catecholamines in relation to pain scores. The results suggested that the secretion of catecholamines was not a useful objective measure of pain following myocardial infarction.

4.4.18 Questionnaire Analysis

The purpose of asking patients to complete a questionnaire following their discharge from CCU was to provide an overall representation of how they felt about their care in CCU and to provide details related to their pain experience associated with myocardial infarction. It was hoped this information might provide a better understanding of the previous results. The patients were given the questionnaires as described in the previous section on the 4th day of their admission and they were collected the following day by the researcher. A total of 54 patients completed these questionnaires at this time. The remaining six patients were unable to complete these for a variety of reasons. In the PCA group 2 patients died (one developed cardiogenic shock, the other had a cardiac arrest), another who had an expressive dysphasia following a Cerebrovascular Accident was unable to comply with the study procedure. In the control group one patient was diagnosed with pancreatitis and was withdrawn from the study as she was transferred to the surgical unit, another developed a Ventricular Septal Defect (VSD) as a complication of her MI and was transferred to another hospital for cardiac surgery and one patient had a cardiac arrest and died in CCU. The reasons for these deaths and withdrawals are a result of complications which can be associated with MI (Jowett and Thompson, 1989). They were unlikely to have resulted due to differences in diamorphine administration associated with entry to the study as opiates were the standard treatment which would be given for pain post MI. Completed questionnaires were therefore received from 28 of the control group (93%) and 26 of the PCA group (87%).

A further patient in the control group died following his transfer from CCU on the general medical ward following a cardiac arrest. Prior to his death he had partially completed the questionnaire. The data which were collected from this patient were included in this analysis.

The questionnaire was divided into three sections; the first asked the patients about their experience of pain prior to their arrival at hospital, the second related to their admission to hospital and the third section which composed the bulk of the questionnaire related to their experience whilst in the CCU.

Due to the small sample size this resulted in small numbers of responses in each category therefore it was decided that the presentation of the results in this section would be in the form of descriptive reporting. The responses to open questions are reported in Appendix XXVI.

4.4.18.1 Patients Knowledge of their Condition

The researcher wanted to find out whether the patients knew if they had angina or a previous MI in the past as it was thought prior experience of this may have influenced their behaviour related to their pain perceptions, reporting of pain and expectations of pain control. It has also been suggested in the past that patients attribute pain in the chest as being a serious condition (Melzack and Wall 1988). Therefore it was relevant to find out whether the patients knew if they suffered heart disease as this could have influenced their behaviour. To elicit this information the patients were asked *"prior to your admission did you ever suffer from angina?"* 12 patients in the PCA group in contrast to 6 patients in the control group had suffered angina. 12 patients in the PCA group and 15 patients in the control group reported they had never had angina. More patients in the control group (6 v 3) did not know if they had suffered angina before their admission. The patients' reports of previous heart disease was compared to the information documented on admission by staff. The incidence of heart disease reported by staff was greater then the incidence reported by patients (10 v 6 in the control group) which suggests these patients either did not know they had heart disease or that they had been told yet chose to ignore this.

4.4.18.2 Delay in Seeking Help

In order to assess the delay time in seeking assistance the patients were asked *"Before you came into coronary care, how long did your chest pain/discomfort last before you contacted a Dr?"* The results showed the patients in the PCA group demonstrated a greater tendency to seek assistance sooner (15 in contrast to 11 patients) than in the control group. Approximately half the patients contacted a doctor within an hour. The majority of patients in both groups reported they would seek assistance within less than 6 hours (24 in the PCA group and 15 in the control group). Therefore overall, 74% of the patients reported they would seek assistance within 6 hours of the onset of pain. The early initial contact from the onset of MI with medical services is important both for the initiation of early thrombolytic therapy and for the early detection and treatment of cardiac arrhythmias.

It was of interest to determine whether having previously had heart disease would affect the patients behaviour i.e. would they summon help sooner? The results are shown in Figure 4.6

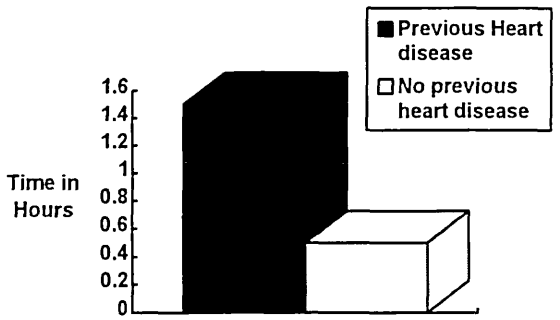


Figure 4.6 Time to Seek Medical Assistance

This showed the median time for those with known heart disease to summon help was 1.5 hours. The median time for those with no previous diagnosis was 0.5 hours. Analysis using the Mann Whitney test showed that there was no significant difference in the time of either group to summon help ($P > 0.05$). Therefore it appeared previous diagnosis did not affect the initial call for medical assistance.

4.4.18.3 Pain Experience Prior to Admission

With reference to the pattern of pain experienced, patients were asked " *Was the pain coming and going or constant?*" The responses to this question showed the presentation of pain associated with MI was most often continuous (24 of the PCA group and 23 of the control group).

The subjects were asked to score the intensity of their pain prior to admission. Their responses can be seen in the following graph (Figure 4.7).

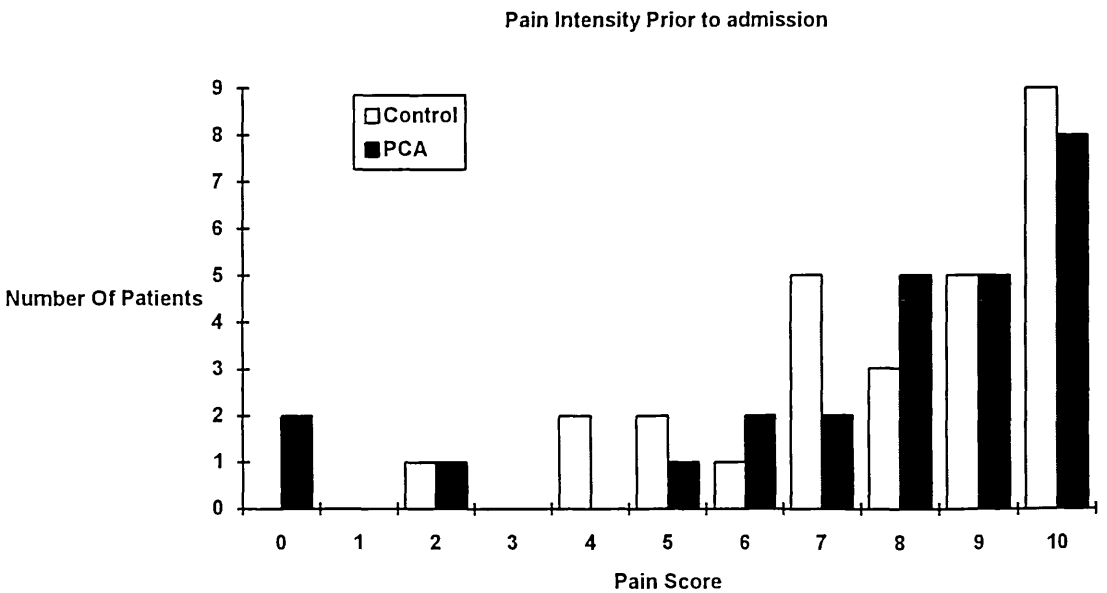


Figure 4.7 Pain Intensity Prior to Admission in PCA and Control Group.

It can be seen that almost one third of patients in both the PCA (N=8) and control groups (N=9) reported this pain as being the worst possible pain (NRS = 10). A further 40% in PCA (N=10) scored their pain at 8 or 9 with 24% (N=8) of the control group doing the same. It can be seen the majority of patients therefore experience severe pain associated with their MI.

4.4.18.4 Pre Hospital Analgesia

Question 5 aimed to find out what patients had been given for pain prior to their admission to CCU. Bearing in mind the intensity of pain experienced, associated anxiety and the deleterious consequences which untreated pain may have in this potentially unstable situation it would be expected reasonable pain relief would be provided. The results however do not support this.

Table 4.19 Pre Hospital Analgesia

Treatment for Pain	Control	PCA
GTN Spray	11	14
Tablets	5	5
Injection	9	11
Nothing	5	2

Of the patients admitted to CCU approximately one quarter of the patients said that they had been given GTN spray. One sixth said that they had been given tablets. One third (20 patients) remembered being given an injection, presumably of an opiate. Seven patients do not remember receiving anything at all for pain relief. Eight patients reported that they could not remember if they had been given anything or not. This may have been as they had received opiates or because they were feeling acutely unwell at this time.

If we assume those who could not remember were actually given opiates, this suggests at best 52% received opiate analgesia. If those who could not remember did not receive anything for pain then only 33% of the patients were given opiate analgesia before reaching

CCU despite being admitted to hospital via the A&E department where they would have been seen by both medical and nursing staff.

In relation to the drugs given which were documented on admission by the staff this showed 25 of the control group and 30 of the PCA group had received some form of drug therapy prior to their admission to CCU. A certain amount would have received this in the A&E department (15 of control group and 12 of the PCA group) (The drugs need not however have been opiates).

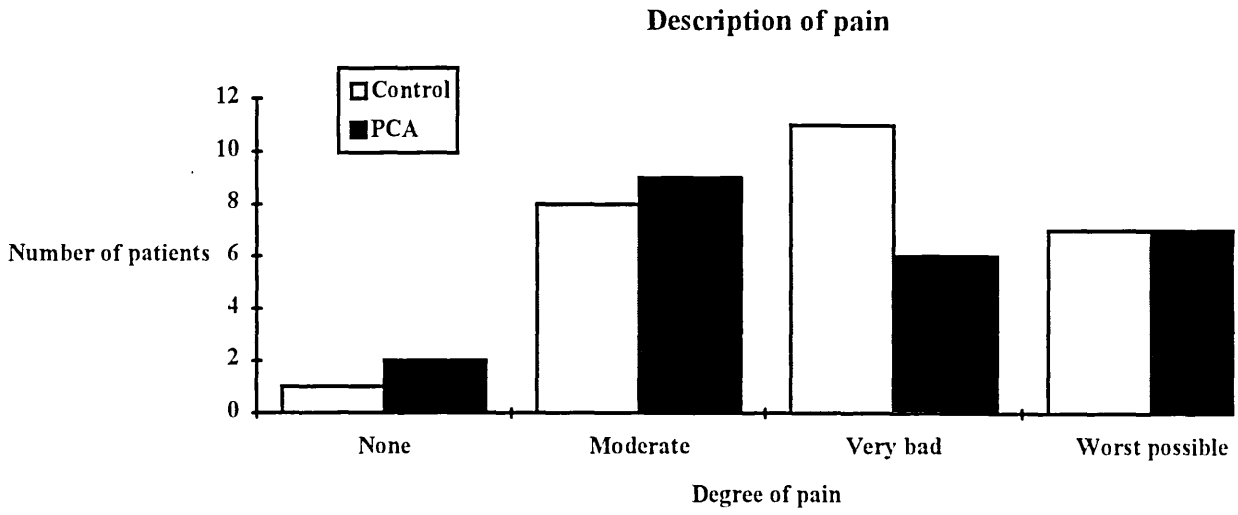
When asked *"Did this help your pain or discomfort?"* (question 6) 6 of the control and 9 of the PCA group said not at all; 7 of the control group and 6 PCA subjects obtained only slight relief. This suggests half of control and two thirds of PCA patients received inadequate pain relief. One third of control and one quarter of PCA patients obtained quite a lot of relief but only a small proportion of each group achieved complete relief of pain (1 control and 2 PCA subjects respectively). 2 patients in the control group could not remember and one did not know whether it had helped or not.

These results show the experience of patients prior to their admission to CCU is far from ideal. The subsequent questions were designed to identify if the situation was any different after they were admitted to hospital.

4.4.18.5 Patients Experiences in Hospital

The patients had been asked to describe the severity of their pain, rating it as the worst possible pain, very bad pain, moderate pain, no pain at all or to state if they couldn't remember when they arrived at hospital. The responses are seen in figure 4.8

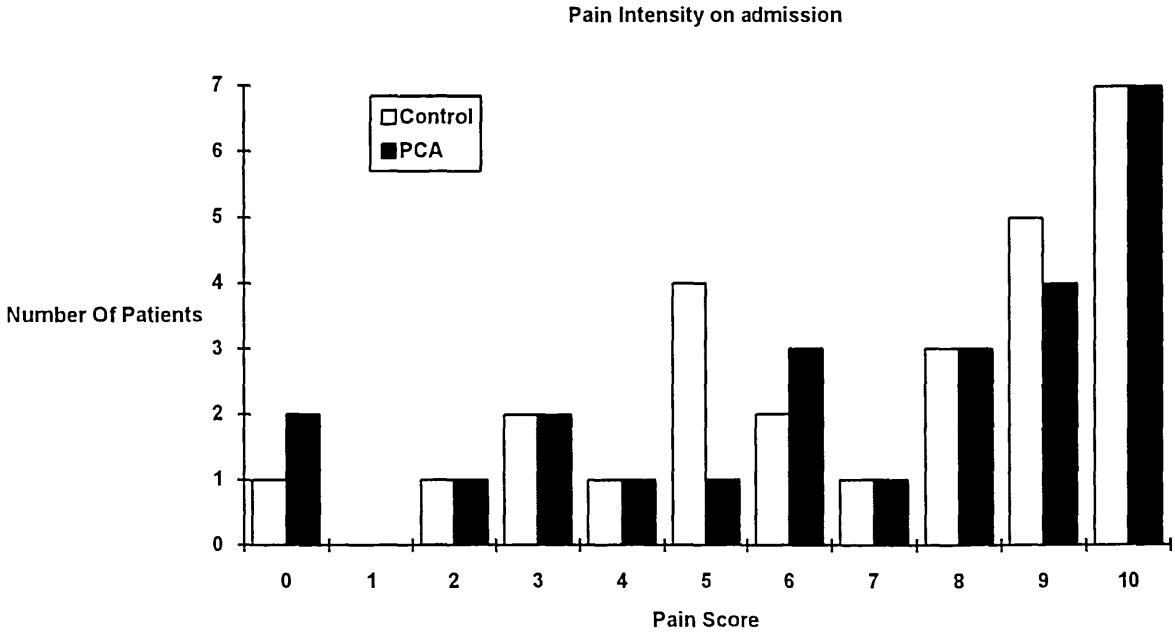
Figure 4.8 Description of Pain Severity on Admission



* 2 patients in the PCA group reported they could not remember the degree of pain experienced

It can be seen on their arrival at the hospital the majority of patients described their pain as moderate to severe (85% (22) of the PCA and 77% (26) of the control group). These reports were supported by the scoring of pain using the NRS related to the intensity of pain on admission (Question 8). The responses are presented in Figure 4.9

Figure 4.9 Pain Intensity on Admission to Hospital



76% (19) of the PCA and 81% (22) of the control group scored their pain at that time as equal to or greater than 5 on a 0 to 10 numerical rating scale. This suggests the majority of patients on their arrival to hospital still have a significant degree of pain.

Question 9 onwards related to the patients stay in the coronary care unit. Since understanding and information have been reported to influence patients behaviour in the past the subjects were asked *"During your time in Coronary Care was the cause of your pain explained to you?"*. The responses first allowed them to describe if this had been done and who had done this. In approximately half the patients in both groups (control 44% (12) and PCA 50%(13)) this was done by both the nursing and medical staff. This suggested both groups of staff explained what had caused their pain. No information was available as to whether they were told the same thing by nurses and doctors. Five of the control group and 2 of the PCA group reported being told by the nurse alone (18% v 8%). Six patients in the PCA group and 3 patients in the control group reported being told by the doctor alone (23% v 11%). In both groups only a small proportion reported either no one explained this (4% N=1 of PCA and 7% N =2 of control) or they couldn't remember (11% N =3 and 15% N = 4 of PCA and control groups respectively).

The patients were then asked *"What were you told?"*. This open question allowed the researcher to gain some information as to their understanding of the cause of their pain and as to what information they had retained. The responses were transcribed and categorised. The results are shown below (table 4.20). This demonstrated that many of the patients actually described the mechanism behind their MI rather than the cause of the pain. This was not the expected response but revealed some differences in patients' understandings of the question which had not been apparent in piloting the questionnaires.

Table 4.20 Cause of Pain as identified by the subjects

The Cause Of Pain	Control Group	PCA Group
The heart/heart attack	10	10
Reduced oxygen supply	1	0
Blood clot	3	7
Blocked artery	4	0
Inflammation	1	1
General recovery advice	2	2
Can't Remember	2	2

* 8 patients did not complete this question

It can be seen that most patients responded by saying the thought that it was caused by the heart or a heart attack. The next most common response was that it was caused by a blood clot or blocked artery. One patient reported inflammation, therefore it was likely he suffered pericarditic pain as a complication of his MI. Three patients had misunderstood the question and responded by recording what they had been told about their general advice or recovery. Two in each group couldn't remember and three patients in the control group and five in the PCA group did not complete this question.

These responses suggest they had retained some information related to their diagnosis. This may be because the diagnosis of MI is emphasised by both medical and nursing staff prior to the prescription and administration of thrombolytic agents. These responses were surprising as it is common for staff to tell patients what has caused their pain and the patients themselves recalled that they had been told it was important to report any pain during their stay in CCU (see next response). The report by MacKintosh (1994) suggested patients did not recognise the significance of the sensations they felt and did not relate them to their cardiac condition. It is also possible the administration of narcotic agents and the physical and emotional stress subjects experienced could result in problems with memory and recall of information.

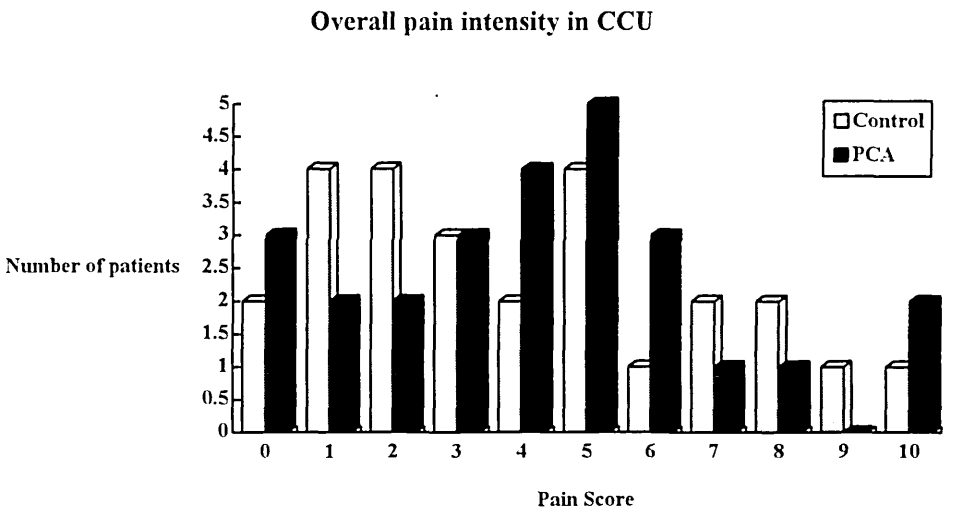
Patients were all asked *"Were you told it was important to report any pain/discomfort immediately?"* in order to find out if non reporting of pain was related to a lack of emphasis on its importance by staff. The responses to this question demonstrated the staff do emphasise the importance of reporting pain as the control group reported yes in 100% (N = 27) of the cases. In the PCA group this response was slightly lower 88% (N =23) but still demonstrated a high priority. Of the remaining patients in the PCA group one reported he had not been told this and two could not remember.

Patients were then asked *"How much pain/discomfort did you have in Coronary Care ?"*. This question aimed to provide an overall picture of the patients pain experience throughout their 48 hour stay in the unit. A small proportion of patients in both groups reported they had no pain (7% N = 2 control and 8% N = 2 PCA). Presumably this was after their initial reported episode of pain as all patients had experienced further pain on entry into the study. The PCA group reported a little pain more often than the control group (58% N = 15 v 48% N = 13). The reverse was seen in relation to those reporting a lot of pain, more patients in the control group (37% N = 10) reported this versus 31% (N = 8) of the PCA group, while 7% (N = 2) of the control and 4% (N = 1) of the PCA group couldn't remember.

Information was again requested related to the pattern of pain experienced in CCU to determine whether the characteristics of continuing pain were the same or different from their initial presentation. The responses on this occasion showed a different pattern. In more cases in both groups the pain was described as coming and going (54% N = 14 control and 54.5% N = 13 PCA) as opposed to constant (23% N = 6 control and 37.5% N = 9 PCA). Of the remainder 19% (N = 5) of the control group and 8% (N = 2) of PCA reported no pain, one patient in the control group said that he could not remember. These results were different to the patients pain experience prior to admission to hospital when most patient had said the pain was constant (see 4.4.17.3)

In an attempt to get an overall measure of the intensity of pain the were asked "While you were in Coronary care, overall how severe was your pain/discomfort?" and to score their pain/discomfort overall on a scale of 0 - 10, where 0 = no pain and 10 = worst possible pain. The results are shown below (Figure 4.10).

Figure 4.10 Pain Intensity over 48 Hours in CCU in PCA and Control Groups



The results show 44% in NCA and 46% in PCA scored this as 5 or more. It seems these results suggest that a large proportion of patients in CCU still suffer a degree of pain although this is not as intense as the pain they experienced either prior to or on admission to hospital. 12% of the PCA group and 7% of the control group reported no pain.

Some patients have difficulty describing their pain experience, and therefore the patients in this sample were asked to score "*how easy or difficult it was to describe your chest pain/discomfort, where 1 = very easy and 5 = very difficult to describe?*"on a 5 point scale. The results for the control group showed 54% (N = 14) found it easy to describe 45% (N = 12) difficult and 4% (N = 1) neither easy nor difficult. In the PCA group 44% (N = 11) found it easy to describe, 28% (N = 7) difficult and the remainder, 28% (N = 7) found it neither easy or difficult.

The patients were then asked to describe their chest pain or discomfort to try to elicit whether their responses were similar to those previously reported in the literature (Camp O'Sullivan 1991). The responses were categorised and coded. Many of the descriptors identified were those described in the McGill Pain Questionnaire (MPQ) a tool commonly used for pain assessment. There were also some additional terms used to describe pain which have been included. The responses were therefore grouped into the five categories of sensory, affective, evaluative, miscellaneous and other. Descriptors of pain intensity were also coded and two additional categories, the location of the pain and associated symptoms, were included.

Categories of pain descriptors identified by patients.

Sensory	Affective	Miscellaneous	Other	Intensity of Pain
Sharp	Hurt	numbness	squashed	Very Sore
Shooting	sore	tightness	Indigestion	Severe
Tingling	heavy		stunning	Excruciating
crushing	ache			
pressure	weakening*			
Like a vice*				
Pain Band*				
gripping				
stabbing				
Like a knife				
Burning				
Pulsating				

* These items were descriptors used by patients and added by the current investigator

The results of the codings are shown below in Table 4.21

Table 4.21 Descriptors of Cardiac Pain

Category	Number of descriptors used	
	Control	PCA
Sensory	9	12
Affective	4	3
Miscellaneous	4	9
Other	2	3
Intensity	7	7
Location	11	11
Associated symptoms	2	2

One patient did not complete this question and one found it impossible to describe his pain. The remainder of respondents described their pain, most often using sensory descriptors. As well as describing how the pain felt it can be seen many in both groups described the location of the pain and some associated symptoms. For some patients the associated symptoms were even more distressing than the pain as can be seen by one patients response " *The pain was very sore, it would start in the middle of my chest then spread, but the worst thing was the shortness of breath.*" Another patient described " *more discomfort than a pain. Like breathing in very cold air and having it lying on the chest. I was sweating profusely but felt cold and shivering and very panicky. I had also been feeling sick*". These comments also reflect the intense emotional arousal which is associated with myocardial infarction.

4.4.18.6 The Behaviour of Patients who are in Pain

The subsequent two items related to how patients felt they behaved whilst they were in pain. The first question *"When you had chest pain/ discomfort how soon did you report it to the staff?"* examined the patients perceptions of how they would behave. The majority of patients in both groups said they would report pain immediately 17 of the control group (63%), and 19 of the PCA group (76%) choosing this response. Within the control group 4

(15%) said would wait up to 30 minutes and one patient (4%) said he would not mention it. In the PCA group 4 patients (16 %) said they would not mention it. Within both groups the remainder of patients said they had no pain to report (4 in the control and 2 in the PCA group).

Despite these responses this still meant one quarter to one third of the patients would not report pain immediately. The subjects were asked for their reasons as to why they did not report pain and their responses are shown in table 4.22. Three (15%) of those who did not report pain immediately said it was because they expected to have pain after a heart attack, 3 (15%) said the pain was less severe than before, 2 (10%) did not want to bother the staff, 5 (25%) thought it would get better and 7 (35%) gave another reason which was either they had no further pain (N=3) or the had the PCA pump (N=4).

Table 4.22 Reasons for Not Reporting Cardiac Pain in the Study Population

Reason for not reporting pain immediately	**Control Group N = 11**	**PCA Group N = 9**
Expected to have pain after a heart attack	1 9%	2 22%
Pain less severe than before	2 18%	1 11%
Did not want to bother the staff	1 9%	1 11%
Thought it would get better	4 36%	1 11%
Other reason *	3 27%	4 44%

The responses showed more patients in the PCA group expected to have pain after a heart attack (22 v 9%). More in the control group thought it was less severe than before (18% v 11%) and it would get better (36% v 11%).

The control group only were asked; *"when you asked for pain relief when would you expect it to be given".* Almost half the patients (12) said immediately unless the nurse was interrupted by an emergency. Over a third (10) of the patients said when the nurse was not busy, 4% (1) would wait until the next time they were giving out the drugs, 1 (4%) never asked and 3 (11%) would have left it to the nurses discretion.

In case their behaviour was influenced by the staff not assessing pain adequately, information was obtained related to how often they thought staff asked if they had any chest pain/discomfort. In both groups they reported this was at regular intervals (93% and 96% in N =25 NCA and N = 25 PCA groups respectively). Two (7%) of the control group reported they were rarely asked and one patient in the PCA group felt he was asked too often.

At this point the questions in both groups deviated slightly to accommodate the use of the PCA pump against the group who received their analgesia from the nursing staff. Item 20 related to when the patients would be most likely to ask for pain killers when they had pain, or in the case of the experimental group when would they use the pump. This question demonstrated differences in behaviour. The PCA group were more likely to take action as soon as the pain started (84% N = 21 versus 33% N = 9 in the control group). The analysis of this question could take into account the behaviour of the patients when they were given the opportunity either to take action immediately or to defer their action. Analysis using Chi Square showed a significant difference in the behaviour of subjects in the two groups ($\chi 2$ (1) = 15.633; P < 0.001)

The reasons described for not taking immediate action included more of the control group saying they would act when the pain became severe (41% N = 11 v 8% N = 2), 3 (11%) of control group would not ask but wait until it is offered (no equivalent response was available for he PCA group), 2 (7%) of the control group would put up with pain rather than have drugs. No patient in the PCA group responded in this way. 2 (8%) of patients in the PCA group and 2 (7%) in the control described another situation i.e. that he had no pain.

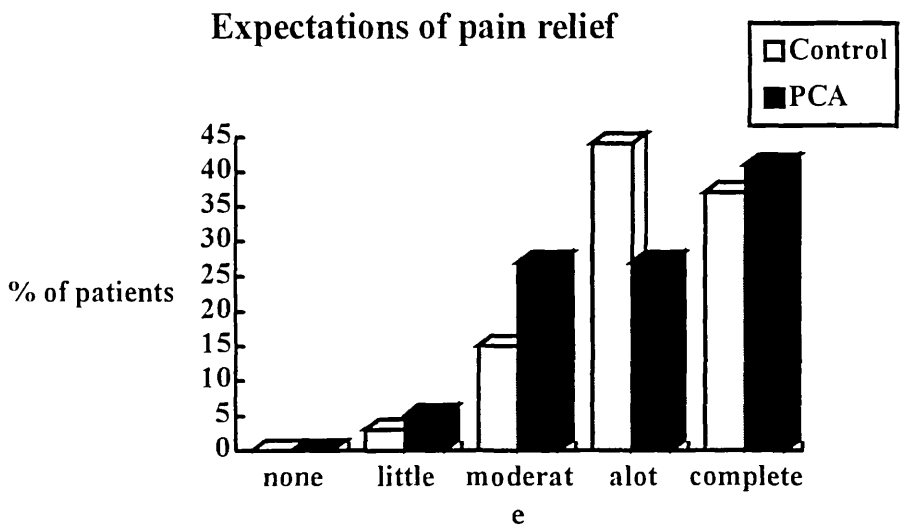
A comparison was made between their previously reported likely behaviour and what actually happened by asking "*After reporting chest pain/discomfort were you generally given painkillers..*" in the control group, and the PCA group were asked "*when you had chest pain discomfort did you use the pump...*".

The results showed most action was perceived to occur very quickly; in the control group 44% reported immediately and even more in the PCA group reported this (75%). Of the remainder 37% of the control group said they received these within 10 minutes and 13% of the PCA group would have taken drugs within this time. In the PCA group a small proportion of patients would still have waited more than 10 minutes before using the pump

(4%). A further 18% in the control group never reported any discomfort and 8% of the PCA group never needed any drugs.

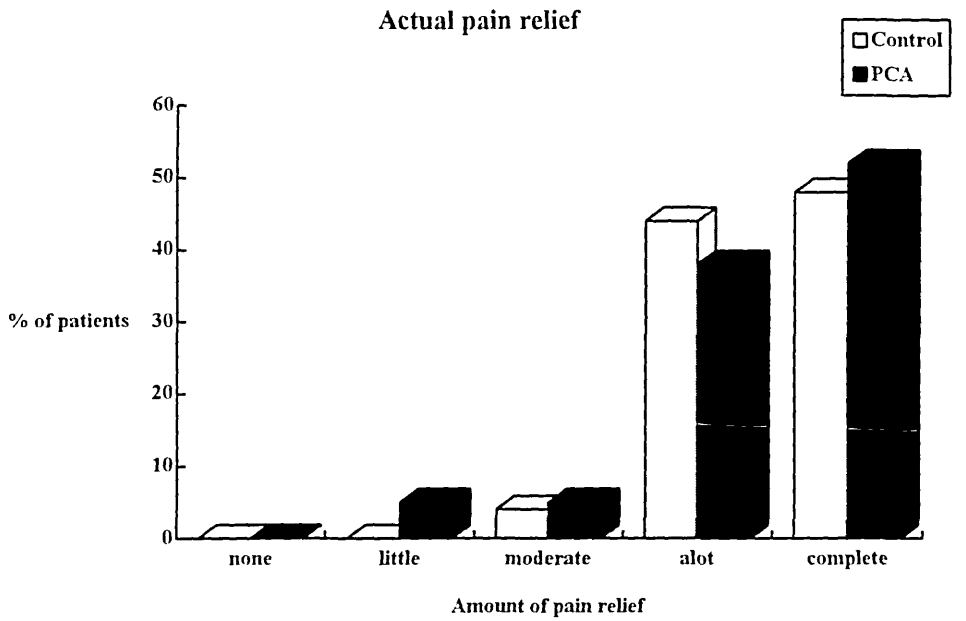
The subjects were then asked about their expectations of pain relief after analgesic administration. Their responses are shown in Figure 4.11.

Figure 4.11 Expectations of Pain Relief



The graph shows of the patients in the control group 1 (3%) expected only a little relief, 4 (15%) expected moderate relief, 12 (44%) expected a lot of relief and 10 (37%) reported they expected complete relief. In the PCA group no patients expected no relief, 1 (5%) expected a little relief, 6 (27%) expected moderate relief and 6 (27%) expected a lot of relief and the remaining 9 (41%) expected complete relief. This shows similar expectations of pain relief in the two groups. In relation to what they actually experienced the results are shown below in Figure 4.12.

Figure 4.12 Pain Relief Experiences Following Analgesic Administration



The graph shows of the patients in the control group 13 (48%) achieved complete relief, 12 (44%) a lot of relief, 1 (4%) a moderate amount of relief and none achieved only a little relief. No patients reported having no relief at all. One patient reported she couldn't remember. In the PCA group 11 (52%) reported complete relief, 8 (38%) reported a lot of relief, 1 (5%) reported moderate relief and 1 (5%) slight relief. One patient (4%) couldn't remember.

A comparison of patients' expectations of pain relief and the relief they actually achieved was made. This looked at whether the patients interpretation of their pain relief was better or it was worse than expected.

Table 4.23 Patients Interpretation of Pain Relief after Myocardial Infarction

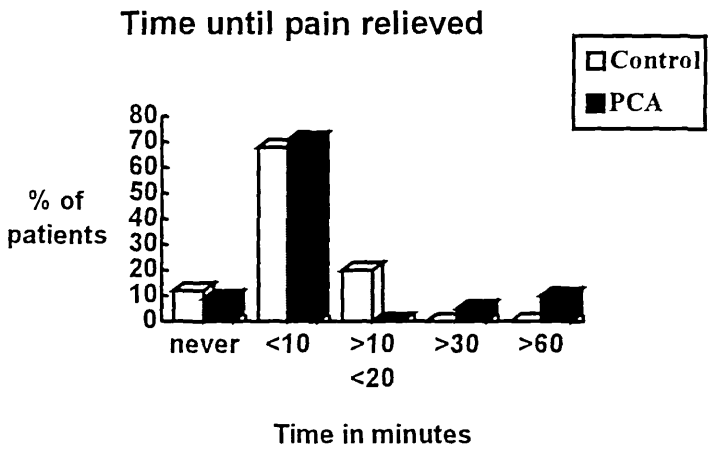
Pain relief was..	Control (N0	PCA (N)
As expected	17	11
Better than expected	8	7
Worse than expected	2	3

There was no evidence for the patients pain relief being better than expected ($\chi 2$ (1) = 0.075; P > 0.05).

Having received analgesia either from the staff or via the PCA device patients were asked" *did the nurses ask whether they had worked*". The responses varied. In the Control group 96% of patients reported the staff always asked if the drugs had worked, and one patient couldn't remember. In the PCA group they felt 76% of the time did staff always ask if the drugs had worked, 14% (N=3) responded more than half the time, in 5% (N=1) felt this was done less than half the time and 5% (N=1) reported never being asked if they had worked and one patient couldn't remember.

In an attempt to define the length of time necessary for pain relief following analgesic administration patients were asked *"When you were given painkillers how long was it usually before the pain went away (even if it came back later)?"* The results are presented below (Figure 4.13).

Figure 4.13 Time Until Pain Relief Achieved



The graph shows for the majority of patients 68% of the control and 71% of the PCA groups pain was relieved in less then 10 minutes. 20% of the control group and 10 of the PCA group said it was more than 10 but less than 20 minutes until the pain was relieved. However 12% of the control group and 9% of the PCA group reported it never went away completely. In the PCA group it can also be seen for 5% it took more than 30 minutes to obtain relief and in 10% it took more than an hour for pain relief. These results are disappointing as it was hoped the provision of access to analgesics would reduce the incidence of continuing pain following myocardial infarction. The results should be interpreted with caution as this is dependant on the recollection of patients and their perception of time may not be accurate.

The patients were asked if they thought they received pain killers often enough. In the control group 96% said yes, and 4% (N=1) said they never required any pain relief. In contrast in the PCA group only 66 % felt they used the pump often enough, 20 % felt they could have used it more often and 12% never needed to use it.

Opinions of pain control after their MI were shown by the responses to question 29. No patients in the control group reported it was inadequate, one third thought it was adequate and two thirds of the patients thought it was good. In the PCA group the proportion who thought it was good was identical, slightly less thought it was adequate (29%) and one patient (4%) reported he felt his pain control was inadequate.

Patients satisfaction with their pain relief was also assessed and 96% of the control group and 100% of the PCA group reported they were satisfied with their pain control after their MI.

To compare their expression of adequacy they were also asked to score this on a numerical rating scale. One patient in the control group scored it as inadequate but none in the PCA group (92% N =26 of the control group scored their pain as adequate at >5 and 96 % N = 23 of the PCA group). Which supports the previous impression the patients were satisfied.

Patients were also asked about their impression of how staff assessed their pain and 88% of the control group felt staff always assessed their pain well, 7% felt usually. In the PCA group 64% reported always and 32% usually. There was a high level of agreement between groups about the concern they felt staff had about their pain (96% and 92%, control and PCA respectively). The remainder of responses showed they were usually concerned.

The remaining questions related directly to the use of PCA. It was important to know if the patients felt they had received adequate instruction about how to use the pump. All patients in the PCA group said yes. In relation to when to use the pump 23 (96%) felt they received adequate instruction. The one patient who didn't said staff " Needed to stress more that it was good to keep using it, since I tried to use as little as possible".

Patients were also asked if they ever had any hesitation using the pump 22 (89%) said no, one (5%) had some hesitation and one patient (5%) never needed to use the pump. Of those who expressed hesitation this was usually "Initially". this can be seen by the comments of these patients who said "Just at first worried you had taken too much" and "Not later on, did at first".

In addition two patients' comments emphasised the need for reinforcement of the information saying "I was in so much pain at the time I didn't take in what they said, it was releasing morphine into your veins, if I'd known this I would have used it more...repeated instructions would help as I'd forgotten I had the pump in my hand". This patient also emphasised he felt that the staff " Needed to stress more that it was good to keep using it, since I tried to use as little as possible... Felt it would be better if I could manage without it-mistake!!".

Patients were asked what they liked or disliked about the PCA devices. The responses were recorded and categorised. The categories of responses fell into 4 areas as identified by Myers (1993), practical issues, staff related issues, pharmacological issues and psychological issues. Not all the items identified in this coding came up with this sample of patients therefore slight modification was made by adding and deleting certain items as appropriate. Each of the patients responses were coded into these categories. The results are shown below in Table 4.24

Table 4.24 Patients Views of PCA

Themes	No of comments
Practical Issues	
Pain of injections	4
Ease of use	3
Staff related Issues	
reduction of the nurse workload	1
reluctance to bother nurses	1
delay in administration of drugs	5
Pharmacological issues	
onset of drug action	2
individual variation in analgesic requirement	1
adequacy of dose	2
Psychological issues	
desire for control	4
security of analgesia being available	2

The issues highlighted by these responses were the accessibility to the drugs and painless method of drug administration. What came out quite strongly in their comments was the fact they liked having the ability to be in control and not being dependant on the nursing staff for analgesia. One patient had commented afterwards he had seen how busy the staff were and even if he had pain at that time would not have notified the nurses but since he had PCA this did not result in inadequate pain relief.

They were also asked about their preference in the future. The majority (91%) said they would prefer to use PCA in the future, 2 patients (8%) said they had no preference as to whether it was self administered or administered by the nurses.

In summary, the descriptive presentation of the questionnaire results has given an overall impression of the patients feelings related to their pain experience associated with MI. This will be discussed in more detail in the following section.

4.5 Discussion

4.5.1 Appraisal of the study design

It was recognised there were certain limitations inherent in the design and conduct of the study some of which were unavoidable while others arose for practical reasons. The limitations and the actions taken to minimise their effects are discussed in the following section. Any potential effects upon the results will now be considered.

It was recognised that the pain scores are not directly comparable as the same number of measures are not available for the control group as the PCA group. However to have asked staff to assess pain every hour as well as before and after every episode of reported pain would have completely altered current practice in the unit and therefore may have greatly influenced pain management. The intention of the study had been to compare PCA as a method of analgesic administration following MI with conventional treatment. Such an alteration in staff behaviour would have prevented this comparison in the clinical setting.

Another potential weakness of the study is the fact the researcher acted as both the administrator of the study and the data collector. The researcher recruited as many patients as possible then administered the questionnaires following the patient's discharge from the unit. In order to minimise the bias which may have been introduced, the researcher, although employed in the clinical area, attempted to have minimal involvement in the direct care of any patient who was recruited to the study. In certain situations this was impossible and it was necessary to have contact with patients who required pain relief. The instance of this was infrequent enough to avoid influencing the validity of the results. All staff who had been instructed in the technique of patient recruitment, followed a concise instruction sheet to minimise any variability in practice. The researcher recruited patients whilst on duty in the unit. This aimed to reduce possible bias from staff who had recruited the patient and then made subsequent pain assessments.

The use of a research assistant to make the pain assessments was considered however since the assessment of pain occurs at the time of the painful event it would have necessitated having a research assistant present at 24 hours per day. The effects of memory on the recall of pain have also been thought to be influential therefore it was desirable to make the measurements as close as possible to real time rather than at fixed intervals for example 6,12,18 and 24 hours following entry to the study. The unpredictable course of cardiac pain may have resulted in lost data if that method had been employed. It was also more practical to have the nurses score pain themselves rather than have a research assistant question the patients. It was necessary for nurses to assess pain and decide on her

intervention as quickly as possible, scoring of pain could have caused unnecessary delays in analgesic administration. In reality the assessments would not be made by a research assistant therefore it was felt this design would have more relevance to clinical practice.

The administration and collection of the questionnaires was found to have certain problems. In the pilot study some relatives had been present when the patients were answering the questionnaire and were answering the questions for the patient. They also interrupted the interaction between the researcher and the patient. For these reasons it was emphasised that the patient should complete the form himself as he was the authority on his pain. The practicalities of spending time with the patients during visiting hours was also very difficult. It is recognised that the patient's family and significant others can play an important part in their recovery process therefore the researcher did not want to impinge on the time they had together. In addition often other patients and relatives wanted to talk to the researcher thinking she was part of the ward team. It was therefore easier to avoid visiting hours and the patients rest periods thus follow up visits were made between 09.00-13.00, 14.00 -15.00 or after 20.00 hours.

It was considered the existence of a 'response set' may arise as a possible problem particularly in relation to the questionnaires as patients may be reluctant to criticise staff care whilst still in the hospital setting. The alternative however of sending questionnaires out to patients after discharge was considered but rejected as this would have reduced the available data. In addition the influence of time over the patients memory for pain may have affected the results. In attempting to minimise these potential weaknesses which have been discussed, the questionnaires were given to the patients following their transfer from CCU but before their discharge from hospital. This allowed information to be collected as soon as possible after the event, however the fact this was done outwith the coronary care unit would have allowed the patients to make negative comments or criticise care if they felt it was necessary. During the collection of data the researcher made every effort to avoid influencing the patients responses.

An additional limitation was the possibility of the 'Hawthorn effect' i.e. the results of the study could have been influenced by the conduct of the study itself rather than as a result of the intervention. The effects of this could have been more influential on the control group and this group were meant to be representative of normal practice within the unit, which could have resulted in a reduction in observed difference between the PCA and control group. The effect it may have had on the control group was to make both nurses and patients more aware of the patients pain which could have focused the patients attention on the need for pain relief and the nurses decision making to alter her approach to analgesic

administration. Recent work has reported the absence of a placebo response to PCA (Thomas 1991).

It was not possible to follow up all patients who had entered the study completely as some had to be withdrawn due to a deterioration in their medical condition. One patient was transferred to another hospital for emergency cardiac surgery, one patient developed cardiogenic shock, one patient was diagnosed with pancreatitis, one was unable to conform with the study procedures and one patient died before data collection was completed. This reflects the difficulty associated with carrying out research in the clinical area however this should not be seen as a deterrent to conduct nursing research. The results which are obtained can be applied to the clinical area.

In the past the use of experimental designs in nursing research because of their artificiality and reliance on quantitative data have been criticised. It is argued that rigid control of the extraneous variables are incompatible with the study of practical problems. Thus the artificiality could be a problem in the study of a complex experience of pain. This study sought to examine the real experience of patients admitted to hospital on a daily basis who suffer this problem, not to observe experimentally induced pain in a laboratory setting. In an attempt to move towards research based practice in the clinical setting it is necessary to conduct research which will be relevant to practical patient management.

The design of this study also attempted to introduce the rigour and strength offered by a randomised controlled trial. The subjects were derived from the patient population admitted to CCU with a suspected MI. Since it was also impossible to predict the potential pain course following MI, people could not be assigned to a study group before they experienced pain requiring opiate administration. In order to minimise the potential lengthy data collection period it was necessary to include all potentially suitable candidates and once they fulfilled the entry criteria they were randomly allocated to a treatment group. Whilst it would have been possible to randomise all potential patients on admission, it was felt this could introduce bias from nursing staff if they knew which treatment group the patient was to be in prior to their decision to administer opiates. Some may have been affected if they had personal attitudes related to their belief in the value of PCA. The attitudes of staff related to PCA were not measured in this study although this has been examined in the field of post operative pain (Myers, 1993).

4.5.2 Appraisal of the findings

This study examined the effects of using PCA in comparison to the conventional method of diamorphine administration (NCA), for the management of pain following myocardial infarction. In addition the study also examined the views of the patients related to their experience of pain and their opinions on PCA.

The two groups were found to be comparable in relation to their demographic characteristics of age, sex and weight. These factors were considered as it has previously been suggested in the literature that they may influence the patients experience of pain. In relation to age it is suggested the elderly population may not experience as much pain or may not report this (Herr and Mobily, 1991; Marzinski, 1991) although this has often not been supported in research studies (Herlitz et al., 1986b, Weisenberg 1977). The failure to report pain and absence of pain related behaviour may lead to misinterpretation of the information. It has been reported that patients may wish to maintain their independence and may be reluctant to admit distress as they fear loss of their autonomy (Clinton and Eland, 1990). They may believe it is not acceptable to show pain and the influence of their cultural values which were established in early life continue to effect behaviour as one gets older (Rusow, 1967). In the current study neither opiate consumption nor pain assessments differed with age.

In contrast there have also been instances of atypical pain presentations in the elderly in a variety of medical conditions. Peptic ulcer disease, appendicitis and pneumonia have been shown to cause only mild discomfort (Butler, 1980, Oliver, 1984). As many as half the myocardial infarctions in the elderly occur in the absence of pain. It appeared therefore that the influence of age could lead to underestimation of the problem. However the results showed there was no difference in age distribution between the two groups. This suggests the differences observed in pain scores could not be attributed to any age difference.

There are also gender differences in pain expression which are learned in early life. Many cultures encourage the expression of pain in women more openly than in men. Despite the potential influence this could have by women openly reporting more pain again this should have limited bearing on the results as the proportion of females in the PCA and NCA groups were equivalent. There were no differences in the median pain scores reported between men and women in this study ($P>0.05$).

The weight of the patient was also considered as it was previously thought that the requirements for morphine may be greater in heavier patients than in small frail people.

Within this study there was no association between weight and opiate administration. Studies which have been performed in children however negate this argument as work done by in children aged 0-15 showed minor differences in the kinetics of morphine. The minimum level of morphine necessary to suppress the clinical signs of pain during surgery was 65ng/ml with no difference in children of different ages. There was also no difference found in the minimum effective level of morphine when the clinical signs of pain were assessed by different anaesthesiologists. The variable body mass of these subjects therefore does not support the argument more analgesia is required by larger people.

Additional factors which were considered included previous history of heart disease and diagnosis of myocardial infarction. It is reasonable to assume previous chest pain associated with angina or myocardial infarction may have influenced the patient's pain experience. Knowledge of the cause of pain i.e. MI could have affected their behaviour. It may cause them to seek assistance sooner as the meaning of pain to the individual can influence their behaviour. The incidence of people with previous heart disease and the proportion of patients who had suffered a previous MI was no different between the groups. Previous heart disease did not affect their reports of pain nor indeed cause them to react more quickly in initially summoning help, reporting pain or requesting medication.

In an attempt to estimate infarct size the Creatinine Kinase (CK) levels were analysed. CK levels released are reflective of the extent of damage to the myocardial cells and thus the maximum level may be utilised as a measure of infarct size. Reports in the literature offer conflicting information. It has been shown that a fairly strong relationship exists between the maximum recorded serum enzyme activity and the infarct size estimated from autopsy (Yusuf et al., 1983; Herlitz et al., 1984a), whereas others refute this as often patients have suffered painless myocardial infarction (Margolis et al 1973, Devkumer et al 1991, Nielsen et al 1991).

Analysis of the CK levels in this study population showed wide variations in their levels however one way ANOVA demonstrated no differences between groups. It was not possible to demonstrate any relationship between pain scores and the maximum CK levels (correlation 0.056 at 24 hours and - 0.0006 at 48 hours N.S.).

Myocardial infarction is often caused by an occlusion of the coronary arteries which causes ischaemia and tissue necrosis. Early intervention with thrombolytic agents has been shown to improve prognosis although there is still debate about the mechanisms by which this improvement is achieved (Selzer, 1989). It has been suggested lysis of the thrombus and the subsequent return of blood flow allowing relief of ischaemia and salvage of the

threatened myocardium are the predominant underlying mechanisms. It is expected that the relief of associated ischaemia would reduce pain. This belief was supported by investigators in the TEAHAT study (1991) who reported lower mean pain scores, a reduction in mean pain duration and less requirement for morphine in the group receiving thrombolytics (Risenfors et al., 1991). This suggested that since reperfusion of the myocardium following thrombolytic administration could restore vessel patency and relieve ischaemia, it was possible that the incidence and intensity of pain could be reduced in patients who showed reperfusion in the current study (section 4.4.10). Within the current study the groups showed a similar distribution for the number in each group who reperfused following thrombolytic administration therefore the reduction in pain scores shown in the PCA groups could not be explained by this alone. No relationship was seen between reperfusion and pain scores after 24 or 48 hours ($P > 0.05$ at 24 and 48 hours respectively).

It should also be noted in the TEAHAT study all patients with no contraindications were also given intravenous beta blockers in addition to thrombolytic agents. Beta blockers in themselves have been reported to reduce chest pain (Herlitz et al., 1986a; Herlitz et al., 1986b; Herlitz et al., 1984b; Richterova et al., 1984)

It was therefore thought important to examine which patients received thrombolytics and if they had reperfused their myocardium. Measurement of reperfusion was made by examination of ECG's observing for a reduction in ST segment size and the development of pathological Q waves (Hogg et al., 1989; Hogg et al., 1988). 31 did not show evidence of reperfusion as opposed to 21 patients who did. Statistical analysis showed no difference in distribution between NCA and PCA groups. Analysis of the relationship between maximum CK and reperfusion showed no significant result (correlation 0.316). In addition the analysis in this study showed patients who reperfused did not demonstrate differences in pain scores or drug usage from those who did not reperfuse which supports the argument that the extent of the myocardial damage is not related to the intensity of pain reported.

The administration of analgesia prior to the patient's admission to CCU was thought to have a potential influence on their pain experience. It is accepted in clinical practice that for decades opioid analgesics have been the drug of choice for pain management in acute MI. Forty six percent of the patients received no opiate analgesia before their admission to CCU. Of the patients who did receive opiates prior to their admission, they were either given diamorphine in the range of 2.5 - 10mg or Cyclimorph 10 or 15 mg. Although a greater number of patients within the PCA group received opiates more often than in the control group, statistical analysis revealed no differences in the administration of opiates

before arrival at the hospital between the two groups. It was therefore assumed the subsequent pain experience of these patients would not be affected.

The pain relief received was sub optimal prior to admission. Even in patients who had received drugs before their admission the majority of patients still had pain on arrival to hospital and in fact on admission to CCU. In fact only three patients reported being painfree on their arrival at hospital. This was reinforced by both their initial pain scores on admission and their subjective reporting in the questionnaire. The mean initial pain score was 4.79 for control group and 4.61 for the PCA group. This emphasises the need to assess and treat pain on admission to hospital. These results support the findings of Wyllie et al., (1994) who reported the majority of patients in her study did not having adequate pain relief on admission to hospital and suggested that opiates should be given more frequently and via the intravenous route prior to transfer to hospital.

The practical issues must of course be considered as to how it would be possible to ensure the administration of opiates prior to admission. It is acknowledged that not all patients will actually be seen by their GP before admission and those who are transferred in directly by ambulance will have no opportunity to receive opiate analgesics. In this sample patients had been asked who gave them analgesia which provided an indication as to how many had been seen by their GP. The results showed 4 of the control group and 10 of the PCA group had been seen by their GP. In reviewing this information to try to identify reasons for this the majority of these patients were admitted from areas surrounding Dundee and transfer to hospital would be longer, the GP in a rural area is also probably more likely to assess patient before arranging their transfer to hospital. In addition many of these patients were admitted to hospital between 17.00 and 08.00 hours when GP's are perhaps more likely to visit patients a t home. This distribution between the two groups is due to chance as patients were randomly allocated to treatment groups before entry to the study. At the time of this study the mobile coronary care unit was still operational where a team from CCU could go out to patients in their homes, assess treat and stabilise the patients before transfer which meant they did receive analgesia. This service is no longer available therefore potentially this problem may be worse than was reported. 'This however was a unique service which would not have been available to the general public in other areas.

The comparison of the subjective pain ratings between the experimental and control groups were compared within two time periods; the first 24 hours after entry into the study and from 24-48 hours. This showed a statistically significant difference in pain scores between the two groups with the PCA group reporting much lower levels of pain than the control group. Over the second day however there were no differences in the pain scores between

the two groups. A reduction in pain had occurred over the time of the observations in both groups but the reduction was greater in the control group. A comparison of the initial pain scores reported between each group was also made to ensure the PCA group had not started from a lower level. These were found to be comparable (4.79 and 4.61 for the control and PCA group respectively). The patients in the PCA group therefore had reported lower levels of pain than the control group which rejects the null hypothesis. It is possible that the lower subjective reports of pain by patients therefore was a reflection of the benefit of PCA.

The duration of pain was also measured. This was calculated from the time of entry to the study to the last recorded administration of analgesia within the 48 observation hour period. This was clearly seen to be longer in the PCA group. This was supported by the amount of opiates used by the patients in this group particularly by the difference in the second 24 hour period of observation. The PCA group used over twice as much drug as the control group in this time. Within the first 24 hours 23 of the 30 patients in the control group and all the patients in the PCA group required further diamorphine (one patient in the control group received only GTN, as by the time the staff returned with the opiates the pain had gone). Within the second 24 hour period only 6 of the control group received opiates and 16 of the PCA group received opiates. The total drug consumption was 186.5mg in the PCA group and 189mg in the control group in the first 24 hours (median values 8mg and 5mg respectively). In the following 24 hours the PCA group administered 56 mg whereas the control group received only 28 mg (median values 10 mg and 5 mg respectively).

It seems more of the PCA group required analgesia on the second day. It may be possible that this was because they received inadequate analgesia on the first day. This seems unlikely as their median consumption was higher but did not quite reach statistical significance. This may however have been a result of the lack of power of the small sample size. In addition the PCA group actually reported significantly lower pain scores than the control group as previously described. It is more likely the reason for increased drug consumption was due to accessibility of analgesia. The continued requirement for opiates however clearly highlighted that pain is inadequately managed and there was a problem with ongoing pain. The persistent use of PCA could be interpreted as a measure of the incidence of continuing pain. The patients in this group had free access to analgesia. This was not the case for the control group who themselves stated that they would often not report pain for a variety of reasons previously discussed in the results (4.4.8.6). The differences in opiate consumption suggest a difference in behaviour between the two groups. The patients in the PCA group did not have to wait for analgesia and they did not have to rely on nursing staff to administer these drugs. This may be supported by the

responses reported in the questionnaires. Patients had been asked when they had chest pain/discomfort how soon did they report it to the staff and between one quarter and one third of the patients said they would not report pain immediately some would wait up to 30 minutes, and others not mention it at all as they expected to have pain. They also said since the pain was not as severe as before therefore they would tolerate this. Some did not want to bother the staff and one quarter of the patients thought it would get better. This behaviour could also be explained by their responses to question 21; *"when you had chest pain when would you be most likely to use the pump, or ask for painkillers"*. Within the PCA group 84% said they would act immediately by using the pump whereas only 33% of the control group would have asked for analgesia. In the control group 41% said they would wait until the pain became severe. The tendency to delay action in this manner suggests that the patients in the control group may not have received adequate analgesia and suffered ongoing pain of less intensity throughout their stay in CCU. Anecdotal evidence of this was provided in one patient, a 46 year old male in the control group who whilst in CCU had repeatedly said he had no pain. Following his transfer to the ward the researcher had gone up to deliver his questionnaire and to arrange a time for collection of the same. In approaching the ward staff to ask permission to see the patient the researcher had asked how the patient had been since his transfer. The nurse in charge said he had reported further pain since arrival at the medical ward and on further questioning had admitted this had been ongoing throughout his stay in CCU. I asked him about this and why he had not reported this his reply was *" well it wasn't as sore as it had been and I didn't think you'd want to know about that."*

This is a pertinent example of the situation which ought not to occur. This behaviour pattern has implications in the clinical setting. The need to control pain adequately for humanitarian and physiological reasons has been emphasised previously (chapter 1). The persistence of pain can have unpleasant and even dangerous consequences. It is desirable to prevent continuing pain in CCU as it has been reported that patients with prolonged pain experiences have significantly increased mortality than those without (Loi et al 1987). It is acknowledged that pain is easier to treat before it becomes severe but if patients behave in this manner then staff will be unable to provide the best relief and management for patients. It is therefore a problem for which solutions must be sought. How can nurses encourage patients to report pain sooner? A small study in the USA attempted to assess the frequency and reasons for non reporting of cardiac pain and the four main reasons were; it was not considered severe enough, patients did not want to bother the staff, patients wanted to see if the pain would go away by itself and misunderstanding.

PCA then undoubtedly offered the patients the advantage of not having to initiate the lengthy cycle shown in Figure 1.6 nor having to deliberate about making the decision as to whether to report their pain to the nurse. PCA can therefore be assumed to offer an improved quality of pain relief for patients with continuing pain. The fact PCA made this problem visible has also reinforced the need to dispel the misconception that pain experience will automatically reduce with time. Half the patients who participated in this study reported that their pain persisted. It was likely that this was less intense than before as often it was not reported. These findings raise several issues. In addition to those already discussed, it begs the question as to what nurses can do to improve pain relief and encourage patients to report pain. All the patients acknowledged that the staff had told them they should inform them if they experienced any further pain. This was also the case in previous studies (Mackintosh 1994). The patients in the current study also reported that they felt staff asked them about their pain regularly. It is accepted there are no definitive criteria for what is meant by 'regularly' and this could be interpreted differently by individuals. This contact by nurses would still create the opportunity to report any pain they had at that time or previously but unfortunately despite these messages patients do not always report pain. The reasons for this may be influenced by the patient's beliefs and/or the nurse's behaviour. This is an area of practice which could benefit from further investigation.

The comparison of nurses and patients ratings of pain revealed a difference between the two groups. When the ratings were examined between nurses and patients overall they showed agreement between the scores ($r = 0.895$) i.e. when the patient scored their pain at a higher intensity the nurses did this too. Total agreement of intensity occurred in 70% of the assessments. In the remainder the tendency was still to underestimate pain scores rather than overestimate this. A similar agreement was reported (Thompson et al., 1994) in a coronary care unit although the measurement tool used in that study was the visual analogue scale as opposed to the numerical rating scale. The current study suggested in the control group the difference between the patients and nurses scores was approximately 0.5 and for the PCA group 0.07. This suggested the staff assessed the intensity of pain in the PCA group better. There are several possible explanations for this. On more occasions in the PCA group the nurses recorded the same levels as the patient. It is possible other factors influenced the nurse's decision of pain intensity. The unit policy for the management of an IV infusion required the nurse to record the volume of drug in the syringe hourly. This opportunity to read the PCA infusion pump would tell them how often the patient had tried to use the pump and how often he/she had made successful deliveries of the drugs within the last hour. It is possible the staff looked at this before

assessing the patient's pain and this could have influenced their judgement. The nurses caring for patients in the control group would not have had access to the same information.

The positive correlation between patients' pain scores and nurses' may have been as the staff in this study were relatively experienced in cardiology. Experience has been shown to be an influential factor on the decision making processes that nurses use in the assessment of cardiac pain (Jacavone and Dostal, 1992). As suggested by Thompson et al. (1994) staff in CCU are likely to expect patients to present with a problem of chest pain therefore are alert to its significance and experienced in assessing pain quantitatively. A small study carried out by Willets (1989) also suggested a correlation between the nurse's perception and the patient's own assessment of pain. Agreement occurred in half the assessments, underestimation in 30 % and overestimation in 20% of the pain assessments.

The reluctance of patients to report pain is supported by the current study which showed between 25-33% of patients would not report pain immediately. Fifteen percent of the control group said they would wait up to 30 minutes before reporting pain, and some (4%) would not report it at all. Similar results were reported by Mackintosh (1994). In addition to the delays in reporting pain, 58% of patients who had suffered pain either in their chest, neck or jaw later revealed that they had not reported this.

One suggested explanation was that the patients were not aware of the significance of their symptoms or that they did not relate them to their cardiac condition (Mackintosh, 1994). This may not have been the case in the current study as patients acknowledged being told it was important to report any chest pain and/or discomfort immediately, however despite this emphasis between a third and a quarter of patients reported they would not do this. The reasons they gave for this were previously discussed.

Patients self reports of their symptoms are often used as a measure of the frequency and severity of their actual symptoms. If non reporting occurs as frequently as is suggested by these results this suggests patients may actually suffer much more pain than staff recognise. Although the results are not definitive, the increased frequency and doses of diamorphine used by the patients in CCU who received PCA in the current study suggested that pain was an ongoing problem. The PCA patients were a comparable group to the control patients therefore this suggests that they may also have suffered continuing pain in the second 24 hour period. It is accepted no firm conclusions can be made drawn, and these results should be interpreted with caution in the light of the small sample size.

Within this study an attempt was made to identify how quickly patients following the onset of chest pain would seek medical assistance. It was of interest to obtain this information as the benefits of early treatment which are recognised by health care staff may not be appreciated by patients. They may not be aware that late presentation can have a significant impact on their treatment and outcome. For example medical staff will only prescribe thrombolytic agents which can affect infarct size within a certain time period. The benefits to patients of this treatment are that it will allow myocardial salvage which will improve their long term morbidity and mortality and also may reduce their pain experience. The results in the questionnaire showed that the majority of patients did seek help early. This contrasts with the study reported by Hofgren et al. (1988) who found the mean time between onset of symptoms and the decision to go to the hospital was 15.2 hours. These authors had however noted a difference in response which correlated with infarct size i.e. those with increased CK levels tended to seek help sooner. This study had been performed 5 years previously therefore it is possible that by increasing the awareness of the general public about the signs and symptoms of heart disease with initiatives such as bystander CPR training and Heartstart UK, this may have influenced behaviour. In addition the hospital catchment area is primarily urban therefore transit time to the hospital is not what would be seen in a more rural or larger city area. General Practitioners are also aware of the benefits of early thrombolysis in the management of myocardial infarction therefore they may initiate transfer to hospital sooner perhaps even without seeing the patients.

The measurements made of urinary catecholamines were used as an attempt to provide a picture related to the stress the patient had been exposed to. Since pain can undoubtedly cause stress and emotional arousal it was thought this could be a potential indicator which would relate to the patient's experience of pain and provide an objective measure of pain. A difference was detected in the levels of noradrenaline secreted on day one but the effect infarction could have on the secretion of catecholamines was considered and repeated measures revealed this effect could in fact be related to infarct size rather than any other effect. The results obtained were disappointing as no measures made of any of the catecholamines related to pain scores therefore this is not a measurement which would be of value in attempting to judge pain experiences of patients. The completion of this analysis has further confirmed the limitations of objective techniques for the measurement of pain.

The intensity of pain was asked about at a variety of time points; before admission, on admission to hospital and throughout their stay in CCU. Comparison of these subjective ratings was made and suggested pain intensity reduced with time.

In exploring the patients' expectations of pain relief it appeared both groups had similar views. The comparison with their expectations of relief and the actual relief they experienced were made. In the control group 37% expected complete relief and 48% reported they achieved this. In the PCA group 41% expected complete relief but this was reported as being achieved in 52% which suggests both groups achieved better than they expected. This was also the case for the patients who expected a lot of relief; in the control group the number who expected this achieved this, (44%). In the PCA group 27% expected this and 38% reported achieving a lot of relief. In the control group 15% expected moderate relief with only 4% reporting this was what they had. In PCA 27% expected moderate relief and 5% reported they had this. In the control group 3% reported only a little relief but no patient reported this was what they had. In PCA 5% expected a little relief and 5% reported this was what they had. One patient couldn't remember. In both groups pain relief was as they expected or better. Two subjects in the control group and 3 in the PCA group reported it was worse than they expected.

The patients were asked about their impression of what was actually done to relieve pain once it had been reported. The PCA group obviously had the opportunity to act independently of any input from nursing staff but for the control group this was an important issue. Almost half the control group felt that pain relief was given immediately. A further 37% said they received relief within 10 minutes. On the face of these results, it suggests intervention occurs relatively quickly. There was no indication of the duration of pain prior to the reporting of its presence therefore it must be acknowledged that this time is additional to the time they have already experienced pain. Tolerance of pain for long periods before it is reported will contribute to unacceptable delays in pain relief.

The duration of time it took for the pain to disappear was asked as it has previously been reported that patients after the administration of opiates have still not been pain free after 30 minutes (Willets, 1989). Patients reported that it tended to disappear quickly after the drugs were given. This initial relief was not ongoing as the persistence of pain was reported. Some patients in both groups said that it never went away completely (12% of the control group and 9% of the PCA group). More patients in the PCA group reported having pain which lasted more than 30 minutes. The control group had reported relief in less than 20 minutes. Despite the fact these results suggest that the PCA group experienced pain for longer the overall reduction in the intensity of pain experienced by the PCA group suggests this pain may not have been severe. This must be viewed with caution as it is acknowledged that pain tolerance may have influenced what the patients thought was acceptable.

Some patients in the PCA group also said they could have used the pump more often. This could possibly have been as it was a new method of intervention in the unit and the staff and patients needed to become familiar with this. Patients may need more encouragement to use PCA to prevent this in the future.

Despite this all patients in the PCA group reported they were satisfied with their pain control, as were 96 % of the control group. It can be difficult to interpret these results particularly when some of the questionnaire responses appear to be a contradiction in terms. Some patients reported their pain relief as being inadequate yet also reported they were completely satisfied with their care. This is possibly related to the fact patients think staff will do their best for the patient and they may be reluctant to criticise care.

When the patients' feelings about PCA were explored they all reported that they received adequate instruction about how to use the pump and one patient felt he needed more reinforcement as to when to use this pump. It was not surprising to find some patients did report initial hesitation in using this as it is a new concept for patients to be given control over their analgesic consumption. Traditionally patients adopted a passive role relying on the nursing and medical staff. The patients did reiterate the need to provide reinforcement in using PCA. There was nothing the patients disliked about PCA the responses were all very favourable. The principal benefits being there was no delay in administration of the drug which suggests this is the biggest problem patients see in the inadequacy of pain relief. The next most frequent response was that PCA avoided the need for painful injections and they liked being in control. The simplicity of use was commented upon. Other benefits which were reported were the rapid onset of action, receiving an adequate dose, the security of the analgesia being there as well as not having to bother the nursing staff especially during busy periods. Their positive responses to PCA were supported by the strong preference (92%) to have PCA again if they were ever in hospital with pain.

4.6. Final points

In conclusion the research study reported in this chapter has described a study completed in a Coronary Care Unit to evaluate the use of Patient Controlled Analgesia for the management of pain following Myocardial Infarction. In relation to the original hypotheses to be measured in this study the results demonstrated that patients who received PCA did experience less pain intensity than the control group. There was also a difference in the analgesic consumption by the PCA and control group with the former receiving more opiates.

The secondary findings associated with both these measures revealed that the duration of pain in the PCA group appeared to be longer. This suggests as well as affecting pain relief the use of PCA has acted as a further research tool and highlighted the presence of unreported pain particularly in the 24-48 hour period after admission to hospital.

There was no difference in urinary catecholamine secretion between the two groups. This would therefore not be recommended as an objective measure of pain experience.

There was no difference in patient satisfaction with either treatment. The analysis of the questionnaires provided some very interesting information related to patients' experiences of pain and has highlighted potential areas for further study.

Patient Controlled Analgesia undoubtedly offers potential to improve the management of cardiac pain. The need for more extensive research within this patient population has been highlighted.

Chapter 5

General Discussion And Recommendations

5.0 Introduction

The management of cardiac pain has been identified as an area within the field of acute pain management which has received little attention in comparison to the study of postoperative pain and cancer pain. The work completed in this thesis has sought to remedy this omission arguing that a better understanding of the problem of cardiac pain, the manner in which chest pain is assessed and treated might well provide the basis for more efficient management of pain in clinical practice. This study arose from observation in practice that pain was inadequately managed and it sought to investigate two areas contributing to the management of cardiac pain; assessment and treatment.

This study was undertaken with three broad aims in mind:

1) To describe current practice in the assessment and management of pain in a Coronary Care Unit.

2) To determine whether training staff would alter their skills in communication and the management of pain .

3) To evaluate whether Patient Controlled Analgesia may be a more effective treatment than intravenous administration of diamorphine by nurses in the management of pain following Myocardial Infarction.

These objectives were addressed through the studies described in chapters 3 and 4. In relation to pain assessment this was investigated in chapter 3 by observing nurse-patient interaction and verbal communication in a Coronary Care Unit. The study went on to evaluate whether a training programme would affect the behaviour of nursing staff in their practice of pain assessment.

The primary aims were to describe the current processes which occurred between nurses and patients during their interactions with patients who were in pain and to measure the subsequent effects of an education programme on the behaviour of nursing staff. This was also conducted with the aim of introducing a pain assessment tool to standardise the method of pain assessment to minimise variability in practice between nurses.

In chapter 4 the main aim was to compare two methods of drug administration and in particular to evaluate the effectiveness of Patient Controlled Analgesia for the control of cardiac pain following myocardial infarction. The results of both these studies have been

discussed in detail in the relevant chapters. The present discussion will therefore span the chapters and discuss the most important findings.

This work has considered the experience of pain in its broadest sense before concentrating on the specific aspects related to pain in patients with coronary heart disease. The contributing factors which influence pain expression and behaviour were considered and the past strategies for the management of cardiac pain. The development of two conceptual models described as Nurse Controlled Analgesia (NCA) and Patient Controlled Analgesia (PCA) were produced to guide the planned research study. This included examination of the complex sequence of events which occurred between patients and the nursing staff during interactions when patients experienced pain in the coronary care unit. The initial steps from the identification of pain by the patient, confirmation of this pain by the nurse, the decision making process through which the nurse progresses before administering analgesia and the subsequent evaluation of its action were identified. The work within this research study concentrated on two particular events in this process; the assessment of pain and the administration of analgesia. The sequence of events described in the NCA model was compared to those described in the PCA model in which the reliance of the patient on the nurse to receive analgesic therapy was removed and the patient had the ability to exert control over his own pain relief.

5.1 The Assessment of Cardiac Pain

The assessment of pain is the first step in the process of pain management and as was stated by Soafer (1984) this requires active effort on the part of the nurse and must begin with the acknowledgement that pain is a subjective experience. The nurse during her interaction with the patient must employ active strategies to elicit information about the patient's pain experience. This is done indirectly by observation of the patient's behaviour however it is essential to remember behaviour and pain expression are subject to many influences. Important information about the experience of pain is derived from the verbal communication which occurs between nurses and patients during interactions. The completion of this study has contributed to the expansion of this knowledge, in particular related to communication between nurses and patients who have experienced cardiac pain. Despite previous work related to nurse-patient interaction there is still only a limited body of knowledge available related to practice in this area. This study has attempted to address this omission and offer a valuable insight into communication processes used by nurses in the management of cardiac pain.

5.1.1 Nurse Patient Communication

The nurse-patient interaction study was designed to answer the questions in the first overall objective as well as the specific questions cited in section 3.2.1. In relation to the first question the results demonstrated that the duration of nurse-patient interactions when communicating with patients in pain in CCU were very short. These results supported the work of studies related to nurse-patient communication in other clinical areas (Faulkner, 1979; Faulkner, 1980; Macleod Clark, 1981; Ashworth, 1980, 1984). It could be argued that the duration and frequency of the interactions are irrelevant. The length of the interaction in itself may not be important if the quality of the information obtained during this discourse is of high standard. It would be of more benefit to the patients to have shorter nurse-patient verbal interactions which made a better assessment of pain and therefore could guide the nurse's decision making processes. Unfortunately the completion of this study demonstrated this was not the case. Limited information was often obtained from which decisions were made and interventions planned.

5.1.2 The Influence of Education on The Practice of Pain Assessment and Control.

Within the available literature it has been repeatedly cited that inadequate education and knowledge of nurses was a contributing factor to poor pain management. To expand on this issue and to address the second objective, in this research study the author sought to examine whether the nursing staff in CCU would alter their verbal interaction times and/or behaviour after attending an educational training programme on pain and its management. The educational input involved attending a one day programme. This format was chosen as it was practical for two reasons. It was suitable to introduce into the time frame of the planned research study and it was representative of the duration of study offered to nurses as part of continuing post basic education.

The findings reported in this study revealed that the median time the nurse spoke to p patient in pain during one interaction was approximately 27 seconds (see results section 3.2.4). There was no difference in the duration or frequency of verbal interactions after completion of the training programme. It was possible the lack of effects seen occurred since the measures chosen for evaluation were inappropriate. The educational programme appeared to have indirect effects on the behaviour of staff and the subsequent therapeutic interventions. A change in behaviour was observed in relation to the quality of information obtained during the assessment of pain. Nursing staff also altered the amount of opiates which were administered after the study day. The nursing staff had altered their questioning techniques. It appeared they no longer accepted the initial response of patients who said

they had no pain on questioning. They would use more probing techniques and acknowledged even when patients did not report pain that this did not mean they were pain free. There was also an increase in the frequency with which relevant questions were asked in making an assessment of pain which could only have benefits in providing adequate pain management for patients in CCU The other interesting behavioural change observed was the large increase in diamorphine administration to patients within the two periods of measurement.

The suggested explanations for the changes in behaviour observed are tentative and merely speculative on the part of the researcher as no direct measurement was made of the knowledge of the staff related to drugs, their pharmacological actions and side effects. Nor were any potential fears and misconceptions held by the nurses employed at that time in CCU ascertained before or after the study day. It is therefore impossible to comment with certainty on any changes in the knowledge and attitudes of staff which may have occurred. Despite these limitations the author suggests the clear changes observed in the amount of opiates administered in the two time periods may be the result of the dispersion of fears and misconceptions related to the action and side effects of diamorphine which the nursing staff may have held. The misconceptions related to opiods have been widely reported in the literature and used to support reasons for inadequate pain management in a variety of settings (Bonica, 1987 Brunier et al 1995; Brockopp et al. 1993, Marks and Sacher, 1973, McCaffery and Ferrell, 1992). In addition a better understanding and reinforcement of the reasons both physiological and humanitarian for the provision of adequate pain control may have served to alter the behaviour of nurses in Coronary care. It is however recognised that the suggestions are limited by the fact that the maintenance of any behaviour change was not reassessed after a period of time. The alterations may in fact have been short lived. Without further evidence it is impossible to say, therefore the author acknowledges that the repetition of the observations may have added strength to the results. Further research into this area in the future could be of benefit for the implementation of nurse education programmes in the clinical setting. The author suggests that this is a very important area to target in the educational needs of nurses entering into cardiac nursing especially if they have come from an environment in which they are unfamiliar with the practical administration of IV drugs, in particular opiates. Targeting staff as they enter into CCU would better equip them with knowledge and allow them to make informed decisions related to the delivery of care to their patients.

The conduct of this research has uncovered other issues which should be addressed and studied further. It was accepted that the effects of this educational programme were limited therefore would a different type of education and training improve the results? A recent study assessed four different interventions and their effects on staff behaviour (McNaull et al., 1992). McNaull (1992) found that the nurses' pain assessments improved with an

increased number of teaching strategies. The group who received all 4 interventions; a letter explaining the procedure for assessing and recording pain scores, personal contact, a poster and a video assessed pain better then staff in the other groups. In contrast a study by Dols et al, (1995) compared two methods of teaching to determine whether nursing staff relied more on patients self reports of pain after either a didactic educational programme or one which explored the nurse's attitudes to pain. The first group were given a lecture and watched a video tape, the other group also did this as well as participating in a group discussion in attitudes. Despite the additional strategy utilised there was no difference in the results following completion of the questionnaire used to assess their knowledge and attitudes to pain management.

There is a need for reinforcement of education and it is essential to try continually to alter attitudes and beliefs of all health care professionals involved in the care of patients who are in pain. The problem of pain requires a high priority in educational curriculum in undergraduate and post registration training. This has been acknowledged by the IASP (1993) in the document produced to direct the education of staff involved in the management of pain. The field is rapidly changing and it is essential to move forward with this change to improve clinical practice and avoid the repetition of the reports of inadequately managed pain, which have been cited in the literature in all fields of heath care. The issues of patients' behaviour, in particular related to their reluctance to report pain, must be addressed. The results of this study highlighted even when there was close monitoring of patients in the CCU patients still did not report pain. Further research should be undertaken to identify the magnitude of this problem. It is also essential to consider strategies which may prevent this occurring which will be discussed further in section 5.3. These issues present a challenge for all staff working with patients in pain. Patients may require support and additional explanation to produce changes in their perception of their experience, attitudes and expectations of pain relief. This is an area which has been highlighted which would also offer a challenge for further research and investigation.

It should be recognised that this part of the study was designed to provide information about the current practice of pain assessment within this Coronary Care Unit and to this extent has achieved its aim. This has added to the knowledge available related to nurse-patient communication. In contrast to previous work where assessment of pain has been studied by looking at documentation of pain records and nursing charts (Mather and Mackie, 1983 ; Davis, 1988; Faries et al.; 1991, Gujol, 1994; Pearce 1993 ; O'Hara 1994) this has allowed observation of 'real experiences' and conversations as they occurred between the patient and the nurse. This occurred without the problems associated with bias or recall dependant on memory or subjective perception of the staff. The inaccuracy of reports of perception of behaviour was demonstrated by the staff survey results.

5.1.3 Staff Perceptions and Actual Behaviour in The Assessment of Pain

This work clearly demonstrated the large discrepancies which existed between the staffs' perceptions of their behaviour related to pain assessment and their observed behaviour. The completion of the survey related to how nurses thought that they assessed pain revealed that they had favourable beliefs of their own actions. They thought that they addressed relevant factors in the majority of occasions. The recorded interactions however revealed this was often not the case. It could be argued that the staff altered their behaviour by the presence of the tape recorders and the observation of their activities. While this potential Hawthorn effect is acknowledged it would be expected the observation of actions in this manner would actually improve behaviour rather than inhibit their communication with patients. It could be argued that the observed results were actually an improvement on normal practice. The possibility of the introduction of bias was also recognised by recording their interactions but again if any bias was present this would have been there during the measurements made in both time periods i.e. before and after the study days. This suggests any change observed could be related to a real change in behaviour amongst the staff. It was however recognised the resultant change was not monitored over time for ongoing effect.

The observed interactions also provided objective evidence of the variability in practice between nurses within one ward. There was little uniformity or consistency in practice and the documentation of pain experiences and nursing actions was poor. The use of tools in the assessment and subsequent management of pain have been advocated as good practice (Pearce 1993) but prior to this study no specific tool was used for the assessment and documentation of pain. The study provided the opportunity to introduce and adapt a tool for the assessment of pain in CCU. The subsequent development of these tools was done with the co-operation, involvement and feedback of all the staff employed in the unit. This involvement has had positive effects, it has allowed the recognition that the nurses' opinions are valued. It has also offered them the opportunity to contribute to a development which has been seen as having a positive benefit for the patient. This strategy has been used successfully in the past (Davis, 1988) and is more likely to sustain the effects of change in this situation. A recent report by Ferrell et al (1995) described the effects of introducing a tested educational model to teams of nurses and physicians who then returned to their place of work to act as role models and catalysts to change the practice of pain management. This technique is an evolving model which was developed with the aim of overcoming existing barriers to pain management and improving pain relief for patients.

The process of communication between patients, nurses and medical staff has altered. This change has been reported in other work (Baillie, 1993). There is now more objective and

detailed evidence available related to the pain experiences of patients during their stay in CCU which has helped improve their care. Examination of the pain assessment charts provides objective evidence of this improvement in contrast to the previous poor quality information which was available (see chapter 3) Anecdotal reports have been made by colleagues who have reported that the manner in which patients communicate their pain experience has continued following their transfer from the CCU environment to the medical ward. It has allowed all people involved in their care to talk a common language and to understand what is being said. This is essential to the process of communication and fundamental to optimise the management of patients in pain. This aim has been recognised internationally and attempts to provide a universally accepted definition of terms related to pain and a taxonomy of pain syndromes. This has been identified as an important step to reduce the impairments in the exchange of information and ideas of scientific and clinical relevance (Bonica 1990, IASP, 1979, Merksey 1986).

Despite training, staff are unlikely ever to be able to assess pain accurately all of the time due to the subjective nature of this experience. Within this study staff did demonstrate a high level of agreement with patients reported scores (70%). This still meant on almost a quarter of occasions the assessment was inaccurate and was most often an underestimate. This calculation is made on 'visible' pain. It does not address the episodes of unreported pain. Another recent study reported CCU staff assessed pain accurately (Thompson et al., 1994). The incidence of agreement was less in the present study, however when the correlation between PCA patients and staff assessment of pain was measured the nurses did score this pain more accurately. It has already been suggested that this could have been influenced by the fact the nurse had more information available to her i.e. drug consumption in the previous hour, than the nurse had when caring for patients in the control group. A limitation in the design of this study which is accepted by the researcher is the frequency with which pain assessments were carried out. This was different in the two groups. The study was designed to compare PCA with the conventional method of analgesic administration in CCU. To have insisted on hourly pain assessment in the control group would have radically altered treatment. It would however be of interest now to do future work related to PCA when a regime was initiated to allow regular assessment of pain in both groups at the same time interval. It is possible more frequent assessment in itself may highlight the problem of hidden or unreported pain. It is possible that by increasing the frequency of pain assessment in the NCA group that NCA may be as effective a method of pain relief as PCA. The increased drug use may have been a result of nurses encouraging the patients to use more drugs in the second 24 hours during their contact at the time of recording the infusion rate. It is possible the opposite occurred in the control group; the lack of need for drugs may have been positively reinforced by staff. This can occur with the use of comments like " Have you had any pain? ....'No? Good'. This may have the effect of

inhibiting the expression of pain even if it does exist. Staff may not be aware that they behave in this way nor consider the influence this can have on patients' behaviour. Nurses are in a very powerful position to exert influence on the behaviour of patients who are extremely vulnerable during their admission to hospital. It is possible the move towards providing the patients with control over their pain management may reduce these effects and reduce some of the feelings of vulnerability and helplessness experienced by patients. This concept would also benefit from further examination.

The results of this study have provided a valuable insight into nursing practice and have given information which can be utilised to encourage the education and training of staff to improve performance in the future and contribute to improved pain management.

5.2 The Treatment of Cardiac Pain

It has been discussed in detail why opiates remain the drug of choice for the management of pain in acute MI (section 1.6 and 2.4). As yet there has been no alternative treatment which has been as effective in managing pain associated with MI, therefore the second main area studied in this thesis is related to alternative strategies of administering analgesics. Previous work supported the transition in clinical practice to involve patients in their pain management (Myers, 1993). This move was from the responsibility of care being in the hands of the nursing and medical staff to the scenario where the patient is responsible for his pain relief. The shift in responsibility is in keeping with the changes in health care where the patient is now being encouraged to become an active participant in his care. The concept of allowing the patient control over his pain relief is not new but its application in the speciality of cardiac patients has only once been reported in a small study (Eltringham et al., 1983).

With regard to the third objective PCA was found to be associated with good pain control. The two groups of patients who had been randomly allocated to treatment groups were found to be comparable with regard to their demographic characteristics, previous history of heart disease, infarct site and size, incidence of reperfusion and opiate analgesia received prior to admission. Many of the outcomes measured showed no conclusive difference. This may have been a reflection of the sample size or sensitivity of the measures chosen. Any conclusions drawn therefore should be interpreted with caution. More extensive study would be required to provide definitive answers. Within the study the areas of clear difference were the pain scores and opiate administration between the two groups which merit further discussion. There was a significant reduction in median pain scores between the PCA group and the control group over the first 24 hours. It can be argued that these results support recent studies in postoperative pain where PCA was found to provide

improved pain control (Myers, 1993; Thomas, 1991). In contrast however the results in this study showed that the PCA group used more analgesia than the control group after 24 and 48 hours. The difference in analgesic consumption was more marked in the 24-48 hour period. Since the two groups entered into the study were comparable it was unlikely that the patients in the PCA group suffered more pain than the control group, particularly since they had actually received a higher total dose and higher median dose of diamorphine than the control group.

This finding is of particular relevance to all staff involved in the management of patients with cardiac pain and highlights the value of performing research which can then influence practice. This observation suggests that the control group were also likely to have suffered continuing pain in the second 24 hours but since they did not have direct access to analgesia they did not ask for pain relief. This could be supported by the patients self reports of how they would behave when they had chest pain (section 4.18). Up to one third of patients admitted they would not report pain immediately and some admitted they would not report this at all. This supports the work of other researchers (Mackintosh, 1994). This is an important finding and clearly highlights the problem which is likely to exist in many coronary care units. Despite the best efforts of the staff patients will not report pain. A variety of explanations were offered by the patients. These included not wanting to bother the staff, it was what the patient expected, the pain was not as severe as before etc. It is essential to relieve pain. If patients will not willingly report their pain then nursing staff must improve their ability to assess pain and elicit this information. They also have a responsibility to inform and educate patients related to the potential harm of enduring persistent pain. In practice, it may be necessary to initiate further clinical investigations in patients with continuing pain to allow therapeutic interventions e.g. coronary angioplasty or coronary artery by pass grafting to alleviate troublesome stenosis of the vessels and prevent subsequent cardiac events. If patients do not report pain they are placing themselves at risk. Continuing pain has been reported in other areas to inhibit recovery and this could be another potential outcome which could be studied in the future. It could then be considered that to offer all patients PCA we could avoid this potential problem. In reference to the discussion in the general introduction the transition from NCA to PCA places the control in the hands of the patients. It removes the influence of the nurse in making judgements as to what and when the patient should have to relieve his pain. The benefits of perceived control have been widely studied and would support this shift of responsibility for pain management to the patient.

It is possible people still look for objective signs of pain. Within this study an attempt was made to measure catecholamines as an objective indicator of pain. This was not however found to be related to pain scores. It had however demonstrated association with infarct

size which supported previous work. The relationship which was reported between the increased levels of plasma adrenaline and pain post MI was not found in this study. It was possible the increase was diluted over time and metabolic excretion. The measurement of catecholamines therefore would serve no useful purpose in estimating pain experience post MI. The technique was unsuitable for every day practice and had revealed no benefit as a research tool.

5.2.1 Comparison of Two Methods of Opiate Administration Following Myocardial Infarction.

Despite the constraints in design which have been discussed, this study provided information of a comparison of two intravenous routes of analgesic administration following myocardial infarction. This will make a unique contribution to the expanse of literature now available related to the use of PCA in clinical practice. Many of the comparative studies of PCA have compared this to intramuscular drug administration. There are obvious criticisms in the design of such studies as there are wide differences in the procedures of intravenous and intramuscular drug administration. In this study the route of administration and absorption are at least equivalent. Within these two regimes the nurse will have a different interaction with a patient administering an injection via the intramuscular compared to the intravenous route. The former will be a short interaction after which the nurse is likely to leave the patient and return after a period of time has elapsed to evaluate the effects of the drug. In IV administration the duration of the nurse patient interaction will be longer i.e. administration will be over 2-5 minutes and continual interaction will occur. The contact of a nurse with patient was reported in the past to have beneficial effects on pain relief (Moss and Myer, 1966). The issue arises as to how much contact the nurse and patient will have after PCA has been initiated. It could be argued the PCA group may have less interaction time with the nurse after the establishment of the infusion as it has been suggested that PCA has benefits in the 'saving of nursing time'. The real time saving benefits are when PCA is compared to the time required for the preparation and repeated administration of drugs. The benefit is that it relieves the nurse of this task allowing more time available to carry out other nursing activities. The patients in the PCA group would have been guaranteed to have at least hourly ongoing contact with staff as they read the pumps according to unit policy. They then have access to the nurse at this time which offers the potential opportunity to report or discuss their pain and its management. This may offer a benefit over the control group who may not have the same opportunity to interact with the nursing staff.

The question arose as to would it be possible to predict who would benefit from PCA as it is an expensive resource with pumps costing approximately £3000.00 each. Some patients

did not require any further analgesia throughout their stay therefore to use the pump in this situation could be questioned. The patients did however like the sense of control the pump offered. This probably did help reduce fear and anxiety which may improve their ability to rest and contribute to recovery. This was evident by the report of one patient who said 'I never had to use the pump not once but it was a great comfort to me to know it was there. I saw how busy the nurses were and I know I would not have called for a nurse even if I had pain.' This is an example of the problems staff are faced with in the clinical situation. Within the remit of meeting the Patients Charter (1992) they should be given choice in their pain management.

The results of this research have shown PCA has the potential for use in CCU. It was received favourably by all patients and was a simple method of drug delivery. No adverse effects were seen related to the use of PCA. In the past it has been suggested that the greatest benefit is derived from PCA when patients are given instruction how to use this prior to the time when it is required e.g. preoperative teaching. This situation would been impossible in CCU as patients are only admitted after the event. The results of this study strongly suggest there was no need for teaching prior to the event. The concept is simple and there were no great difficulties related to patient understanding how to use PCA. This is supported by recent work by Thomas (1991) who reported a post operative study where patients were only introduced to PCA following their surgical procedure. This situation was similar to the use of PCA in the current study. In these surgical patients PCA was also widely accepted without any problems related to understanding and further use.

In the past inhibition of pain management has at times resulted from the organisational policies, for example the prescription and administration of drugs. Advances over the years and the recommendations of the Scope of Professional Practice (UKCC 1992) has allowed nurses to develop and utilise their skills for the benefit of patients. For many staff this has included the administration of intravenous drugs. This has contributed to an improvement in the quality of patient care. It has allowed the administration of drugs at the correct time avoiding unnecessary delays which were commonplace in busy wards where one doctor may have been responsible for the administration of intravenous drugs to all the patients. Developments in nursing will continue and hopefully remove the constraints in care which were previously imposed by role definitions. Many previous studies have restricted the control of PCA devices to medical staff, anaesthetists or members of acute pain teams. The design inherent in this study clearly demonstrated that this technique for pain relief could readily be initiated and administered by nursing staff. In CCU the PCA devices were all set up and programmed by nursing staff. The Doctors input was to prescribe the PCA on a pre-printed prescription sheet and the drug kardex. This was thought to be the most

appropriate method since nurses are in the position of assessing pain daily and making decisions related to the most appropriate intervention.

The investment of time in educating staff about the procedure and equipment was beneficial as this resulted in PCA being utilised in practice without any adverse events occurring. It is clearly not necessary to restrict the control of PCA to medical staff. In fact nurses who have more contact with patients may be more alert to subtle changes in the patient's behaviour and in a better position to decide on an appropriate alteration in their therapy. Adequately educated nurses can initiate and control this treatment competently and with diligence. The fact that this study took place in a setting where staff were accustomed to using IV infusions and drug administration possibly made its introduction easier. Its simplicity however will undoubtedly make it of practical application in other ward areas For example, in some district general hospitals without coronary care units cardiac patients are nursed in busy medical wards. It is likely that the management of pain may be worse in this situation. The staffing ratios will be less and nurses will have even more demands placed on their time. Staff will be unable to deliver the same intensive nursing care. This suggests that the effects on inhibiting patients reporting of pain and consequently their pain management may be worse than in CCU.

In summary, PCA is a useful technique for the management of cardiac pain. It will undoubtedly require further study but it has the potential for use with a variety of client groups. Any patient with continuing pain should be offered this facility. This will allow active participation of the patient in his care and at an early stage. The personal control this offers over the threatening situation in which they find themselves may be beneficial and will complement the philosophy of care which will be fostered throughout their hospital admission and more importantly following their discharge. The concept of encouraging the participation of patients in their recovery is being advocated in the field of cardiac rehabilitation and recovery (Foulkes 1993). The process of rehabilitation has been said to commence as soon as the patient enters the unit therefore it would not seem unreasonable to involve the patient in their pain management

5.3 Future Work

The completion of this study has provided evidence that it is possible to conduct systematic and rigorous research into the delivery of nursing care. The conduct of research in this manner will allow changes in patient care to be based on sound evidence and promote research based practice. The issues raised by this work have generated further questions which could be investigated to build on current knowledge and improve the quality of care.

In relation to the assessment of pain further work is required to evaluate current practice and introduce changes in behaviour. It may be of interest to replicate this methodology to determine the effects of the introduction of tools for the assessment and documentation of pain.

The area of the education of nurses about pain management has the potential for further study. This could be approached from two angles. Firstly in relation to undergraduate or pre registration staff it is essential to alter the priority and emphasis pain is given in educational curriculums. The second group of staff who need to be targeted, probably larger in number and less accessible, are those currently practising. The challenge lies in the introduction, development and evaluation of different teaching strategies to meet the existing deficits in knowledge which may inhibit nursing practice. Would the introduction of an alternative education programme offer similar or improved benefits in changing practice in pain management? Any innovation must focus on something which can be practically implemented. Within the current climate the UKCC (1990) advocate Post Registration Education and Practice (PREP) yet in reality insufficient resources are offered in terms of time and finance to meet these recommendations.

Patient controlled analgesia has the potential for further study. The results of this thesis may be regarded as a preliminary investigation. The small patient sample limited the conclusions which could be made. A replication of this research as a larger, multi centred study would provide more powerful results and allow more conclusive recommendations to be made in relation to the role of PCA in cardiac patients.

PCA could offer benefit to other client groups e.g. those with unstable angina where the pain course is even less predictable than in an MI. In this group pain often comes on at rest with no particular pattern and induces anxiety in the patient. The use of PCA could be evaluated both as a method of pain relief and anxiety reduction. Further work into the aspects of perceived control in association with PCA would be possible.
The use of PCA as a research tool could also be considered as a measure of the incidence of unreported pain. The problem of unreported pain has been highlighted and this is

obviously an area which needs addressed. Further research is essential to examine the extent of this problem. Strategies need to be devised to explore the reasons for this. It would be of benefit to explore patients' attitudes and beliefs which contribute to the persistence of this behaviour. A further area of study would be to examine the behaviour of nurses which may inhibit patients expressing their pain. It may be argued that despite the many advances in practice we have not progressed much if we still manage to influence the behaviour of patients in such a negative manner. There is scope to evaluate the use of PCA in other clinical settings.

This work considered the use of PCA in a Coronary Care Unit. Not all patients with cardiac pain are nursed in this environment. Many are in busy medical wards. Is cardiac pain managed differently in that setting? It is possible pain receives less priority in a general ward setting than in a specialised unit. It would therefore be of interest to investigate how pain is managed in these two different clinical areas. The ease of introduction of PCA into CCU demonstrates its potential application in general wards and would allow a comparative evaluation of PCA in that setting. This has the potential to alter the management of pain for many patients.

5.4 Concluding Remarks

Nurses are currently working in an environment of change and are striving to meet the demands to produce a high quality service. The practice of nursing takes place within a dynamic environment It is essential to move forward with change, to critically appraise practice and learn from the experience of others.

The use of PCA for the control of cardiac pain is one step along this pathway. It is a method of pain control which will require further evaluation but the positive reception from patients and staff in this study suggest it can provide benefit to patients. Its acceptance and wider use in the future may prevent the needless suffering which has previously been associated with cardiac pain. There is no better way to illustrate this point than to share the experience of a doctor who survived a myocardial infarction;

"I only hope that when I die it is by some relatively painless means such as crucifixion."

Anon 1977

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Appendix I

DETERMINATION OF CATECHOLAMINES IN URINE BY HPLC

METHOD: Biorad/HPLC

Materials: Biorad columns
Acidic reagent (M. acetic acid)
Basic reagent (0.5 M NaOH)
Dilution/Wash reagent (M. amm acetate)containing 1gm/L disod. EFTA adjusted to pH 7.5
Glass diluted water
Elution agent(2% amm. pentaborate)

Plastic ware: Urine calibrator (Noradrenaline, adrenaline and dopamine)
Internal standard (Dihydroxybenzylamine)

Procedure: Shake 5-6 biorad columns at a time until the resin is completely suspended. Place in a rack and allow to settle. Remove caps. Snap off tips and allow to drain.

To 3ml of calibrator , QC or specimen add 100ul internal standard, 5 ml dilution/wash reagent and drain followed by 2 x 7.5 ml distilled water. When drainage is complete place clean tubes under the columns and elute with 7 ml elution reagent.

Add 600 ul acidic reagent to each eluate, cap and mix and store at 4 deg C. prior to chromatography.

HPLC: Varian 5000 HPLC with ESA Coulochem 5100A detector and varian 4270 integrator.

Column: 100 mm Shandon column packed with hypersil 5u ODS fitted to a Rhedone 7125 injector with 10 ul loop.

Solvent: Dissolve 3.16 gm citric acid, 4.76 gm KH2P04. 1.63 gm sodium heptane sulphonate H2O and 0.16gm disod. EDTA in 800ml degassed distilled water. Adjust to pH 3.6 with solid KOH pellets and filter through a 0.2um filter. Add 80ml of filtered methanol and make up to one litre with degassed and filtered distilled water. Pump once through the culochem detector at working potentials and recycle continuously at 0.2ml/min. between runs.
The operational flow tare (1.5ml/min) is adjusted to give a retention time for dopamine of 14-15 minutes.

INSTRUMENT SETTINGS:

Coulochem:	conditioning cell	+0.35v
	detector 1	+0.10v
	detector 2	-0.30v

Output - integrator/detector 2 1 volt

Gain 1400
Time constant 10 secs.

Integrator Attenuation 1024
Peak height integration
Chart speed 0.1mm/min

ANALYSIS: Use programme 1 in the integrator.
Set the peak threshold after PT evaluation. Set for calibration (CALLIB=1) and inject the calibration standard. When the run is complete, reset for the specimens (CALLIB=0) and calibration standard.

CALCULATION:

$$\text{Concn.} = \frac{\text{Peak height ratio (specimen)}}{\text{Peak height ratio (calibrator)}} \times \text{calibrator conc.}$$

Appendix II

Information Sheet For Patients

Aim of the Study

The experience of pain is the commonest symptom associated with heart attacks and angina. At present we a re trying to improve pain control within Coronary Care. often when people are in pain they excrete substances in their urine called .

Karen Smith. a Senior Charge Nurse in Coronary Care is carrying out a research study to improve pain control. As part of this study she would like to measure the levels of catecholamines which are excreted in urine by patients following a heart attack.

I would like to ask for your help in gathering this information.

Method.

This will involve the nursing staff collecting your urine samples for 48 hours after your admission to CCU. A further 24 hour urine collection will take place on day 5 when you are on the ward following your discharge from CCU> These will then be analysed by the biochemist.

1. The nurse will discard the first urine sample.
2. Collect all the urine you pass for the next 24 hours
3. If you are transferred to the ward before the 24 hours are up please remind the staff to send the bottle with you.
4. A further 24 hour urine collection will be done when you are on the ward on day 5.

Confidentiality

Your confidentiality as a patient will be maintained at all times. Patients names and or initials will not be used in any publications which may arise from this study.

Consent And Withdrawal

You may refuse consent to participate or withdraw from this study at any time without prejudice and are not obliged to state your reasons.

Thank you for your co-operation.

Patients Signature _____ Nurses Signature _____ Date _____

Appendix III

Information Sheet For Staff

Aim of the Study

The aim of this study is to measure the levels of catecholamines which are excreted in urine by patients following a myocardial infarction. Since it is impossible to be present in the unit for 24 hours per day, I would like to request your co-operation in gathering this data. It appears the best method would be to complete 24 hour urine collections on two consecutive days i.e. for 48 hours. A further 24 hour urine collection will take place on day 5 to compare levels following their discharge from CCU. These will then be analysed by the biochemist.

Method.

VMA bottles will be provided on the ward. the nurse should;

1) Request the patients co-operation

2) Note the time the patient first passes urine after admission. this is the time of the start f the collection

3) **Discard the urine first sample**

4) Collect all the patients urine for the next 48 hours. (NB A fresh bottle will be used at the start if the second 24 hours)

5) Please ensure if the patient is discharged form CCU that the bottle is sent with them and the ward staff are informed of this collection.

6) At the end of each 24 hour period ask the patient to empty his/her bladder and **add this to their collection bottle.**

.

Confidentiality

The confidentiality of both staff and patients will be maintained at all times. Names and/ or initials will not be used in any presentation or publications which may arise from this study.

Consent And Withdrawal

You may refuse consent to participate or withdraw from this study at any time without prejudice and are not obliged to state your reasons.

Thank you for your co-operation. Should any problems arise please do not hesitate to contact me at home (Karen Tel. 67421).

Appendix IV

PAIN ASSESSMENT CHART

SURNAME:

HOSPITAL NO:

FIRST NAME:

DATE:

INITIAL ASSESSNMENT

Patient's own description of the pain(s)

What helps relieve the pain?

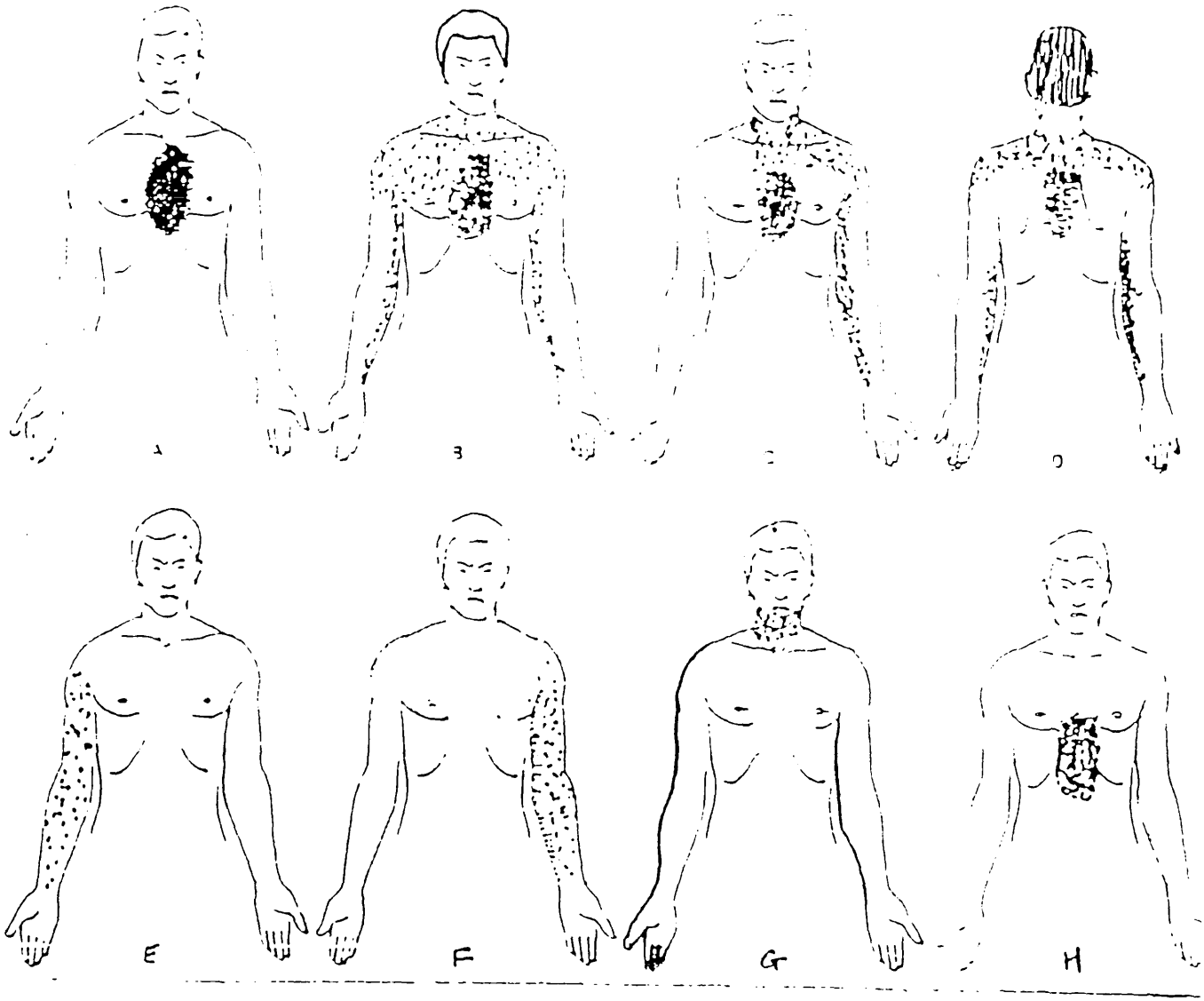
What Makes the Pain Worse?

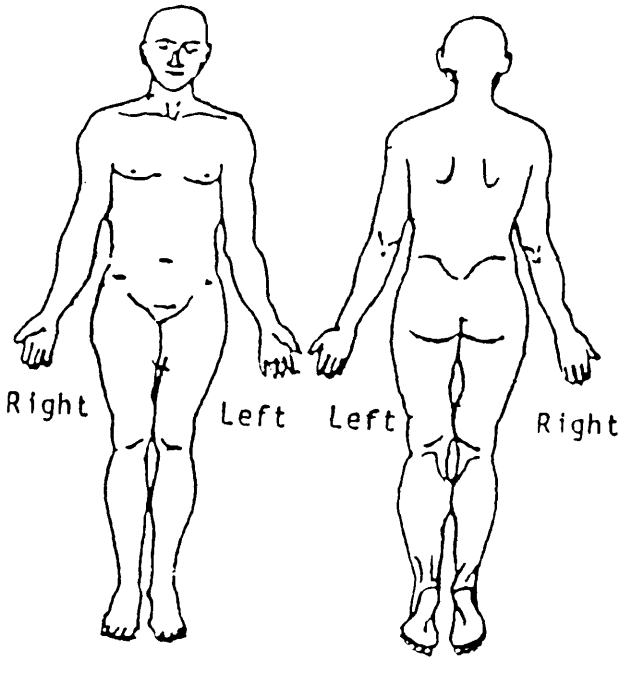
Do you have pain

1) At night? Yes/No (comment if required)

2) At rest? Yes/No (comment if required)

3) On movement? Yes/No (comment if required)





Do any of these words describe your p

Tender
crushing
squeezing
aching
stabbing
throbbing
gnawing
sore
cramping
burning
tight band
heavy / weight

annoying
troublesome
worrying
tiring
frightening
suffocating
terrifying

other
(please spec

Key to pain Intensity

0 = No pain
10 = Pain as bad as it could be
S = sleeping

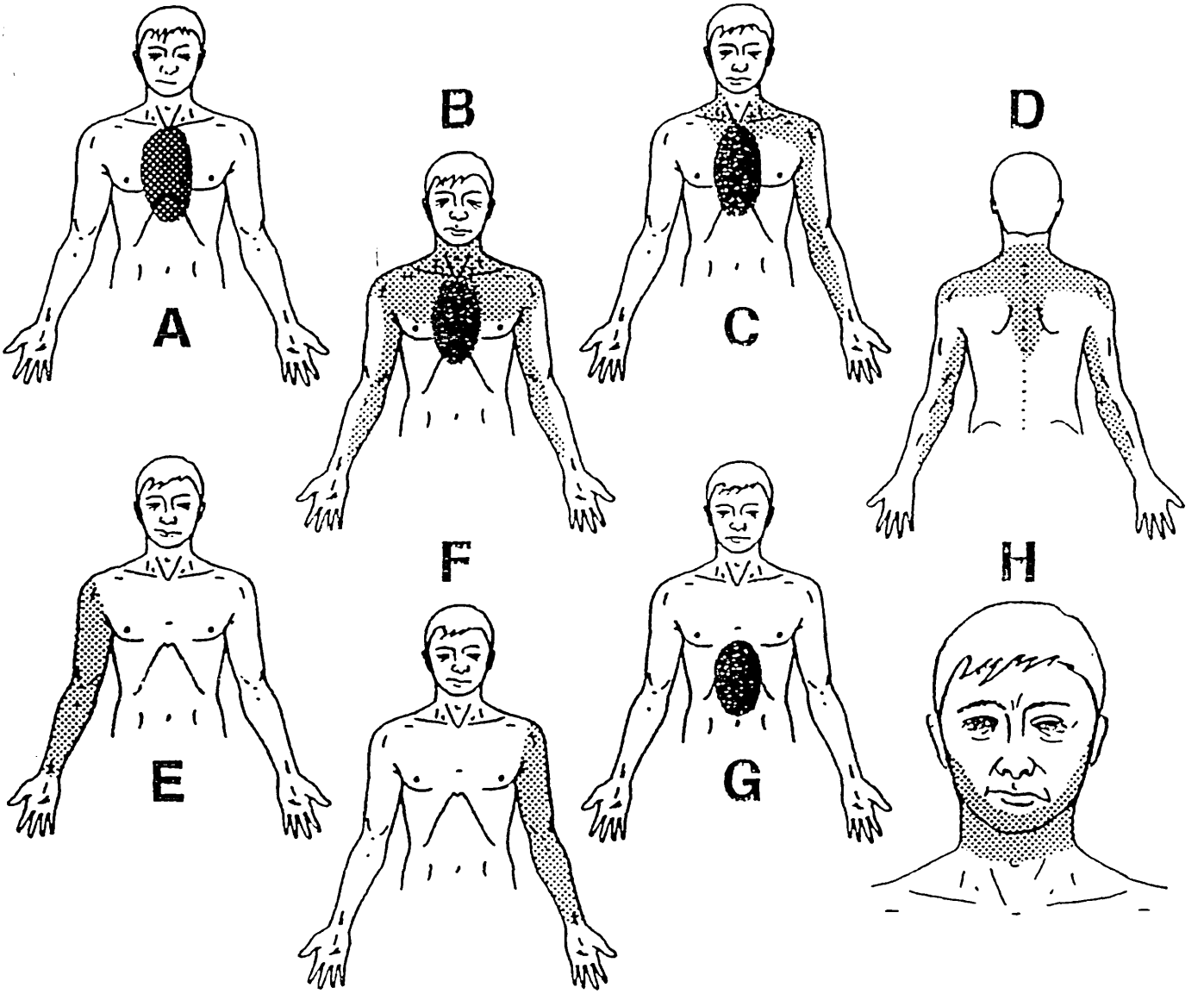
It may be easier to determin=e the intensity of your painby looking at the scale below

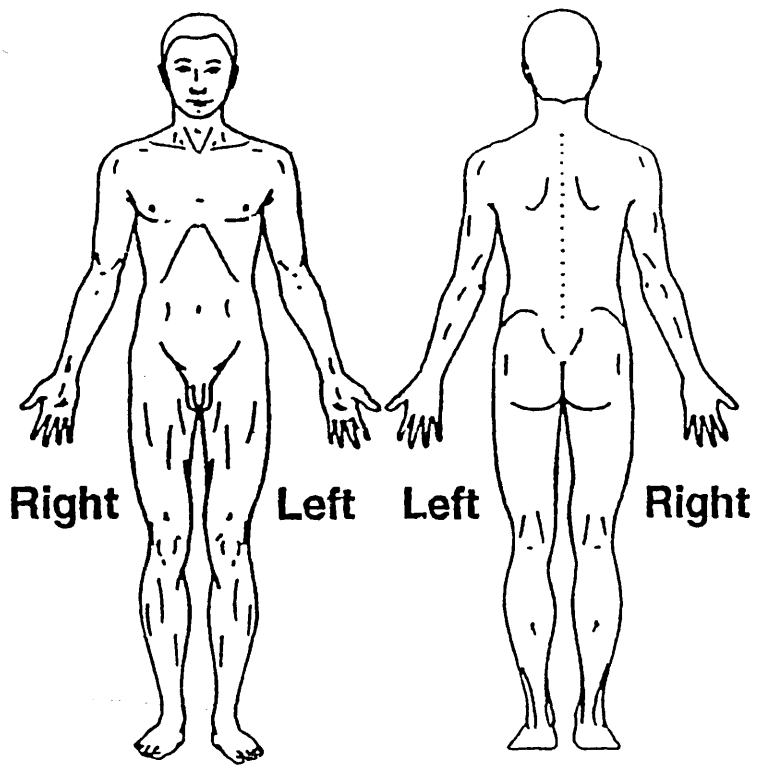
0 1 2 3 4 5 6 7 8 9 10
No pain Worst possible pain

Date/Time	Pain Site	Nurses Score	Patients Score	Analgesia: Name, Route, Dose	Patient Activity & Comments

Date	Time	Evaluation of Action

Appendix V

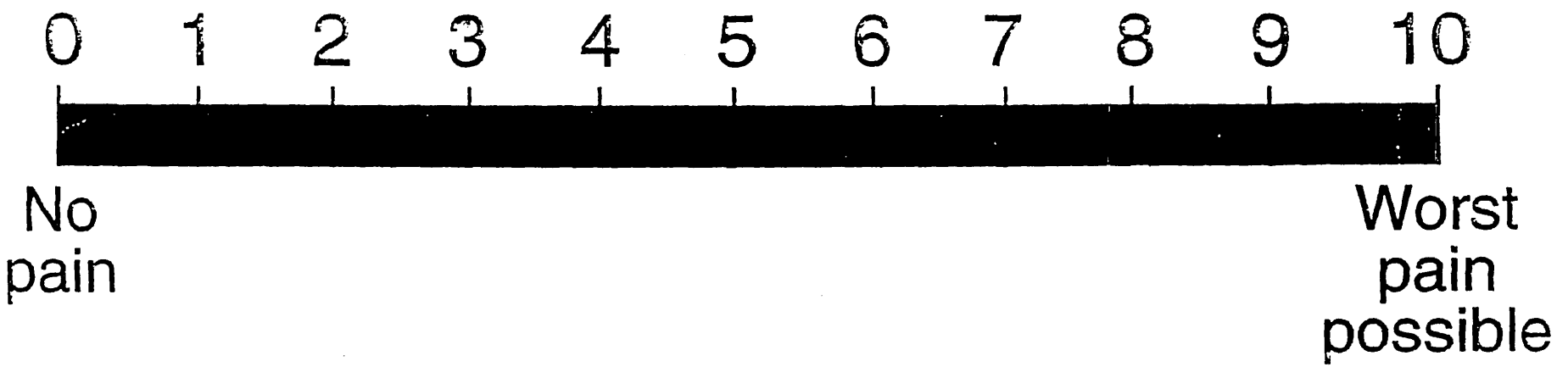




Do any of these words describe your pain?

tender	heavy/weight
crushing	annoying
squeezing	troublesome
aching	worrying
stabbing	tiring
throbbing	frightening
gnawing	suffocating
sore	terrifying
cramping	
burning	other
tight band	(please specify)

Pain Scale



Appendix VI

PAIN ASSESSMENT CHART

Name: **Date of Birth:**

When you assess patients pain please consider the following;

Onset and precipitating factors
Location (with radiation)-define the site of the pain
Duration- how long has it lasted, is there a pattern to it's occurence
Quality - what the patient says it feels like
Intensity (use scale 0-10)
Aggrevating/ relieving factors- what makes the pain better or worse, effects of previous pain relief.

Date and time	**Pain Assessment**

Date & Time	pain site	Nurses Score	Patients Score	Analgesia given :name route, amount.

Patients Activity	Evaluation of Action

Appendix VII

Dear Sir/Madam,

You have recently been a patient in the Coronary Care Unit (ward 21). Since pain is one of the commonest symptoms associated with heart attack the nursing staff within the Coronary Care Unit are interested in improving our methods of pain control. We would therefore like to ask you some questions related to your stay there . This information may help us improve care in the future. Please tick the boxes for the answer which most closely describes your experience.

This information is confidential so please feel free to give an honest opinion.

Here are some questions about your pain before you came to coronary care.

PLEASE TICK

PRE ADMISSION

1. Prior to your admission did you ever suffer from angina ?

yes	☐
no	☐
don't know	☐

2. **Before you came into coronary care,**how long did your chest pain/discomfort last before you contacted a Dr?

less than 1 hour	☐
more than 1 hour but less than 2 hours	☐
more than 2 hours but less than 4 hours	☐
more than 4 hours but less than 6 hours	☐
more than 6 hours	☐
I was not admitted with chest pain	☐

3. Was the pain

coming and going	☐
constant	☐

4. **Can you score the pain you had at that time**on a scale of 0-10, where 0 = no pain and 10 = worst possible pain (please circle the appropriate number)

0	1	2	3	4	5	6	7	8	9	10
no pain										worst possible pain

5. **Before you arrived at coronary care** which of these were you given for your chest pain/discomfort?

spray	☐
Tablets	☐
Injection	☐
nothing	☐
can't remember	☐

6. Did it help your pain/discomfort

not at all ☐
slightly ☐
quite alot ☐
pain cleared completely ☐

ADMISSION TO HOSPITAL

Here are some questions about your admission to hospital.

7. When you **arrived** at hospital how severe was your pain ?

Was it the worst possible pain ☐
very bad pain ☐
moderate pain ☐
no pain at all ☐
can't remember ☐

8. Can you score the pain you had on **admission** on a scale of 0-10, where 0 = no pain and 10 = worst possible pain (please circle the appropriate number)

0 1 2 3 4 5 6 7 8 9 10

no pain — worst possible pain

Here are some questions about your stay in Coronary Care (ward 21)

9. During your time in Coronary Care was the **cause of your pain** explained to you ?

by the nurse ☐
by the doctor ☐
by both ☐
by someone else (please specify) _____
no one explained this ☐
can't remember ☐

10. What were you told ?

11. Were you told it was **important to report** any pain/discomfort immediately ?

yes	☐
no	☐
don't know	☐

12. **How much** pain/discomfort did you have in Coronary Care ?

none	☐
a little	☐
alot	☐
can't remember	☐

13. If you had pain in coronary care was it

constant	☐
coming and going	☐
no pain	☐

14. **While you were in Coronary care,overall** how severe was your pain/discomfort? Please score your pain/discomfort overall on a scale of 0 - 10, where 0= no pain and 10 = worst possible pain (Please circle appropriate number)

0	1	2	3	4	5	6	7	8	9	10
no pain										worst possible pain

15. Please score how easy or difficult it was to describe your chest pain/discomfort, where 1 = very easy and 5 = very difficult to describe (please circle the appropriate number)

1	2	3	4	5
very easy to describe				very difficult to describe

16. How would you describe your chest pain/discomfort?

_____

_____

17. When you had chest pain/ discomfort**how soon** did you report it to the staff

immediately	☐
within 30 minutes	☐
after 30 minutes or more	☐
Did not mention it	☐

18. If you **did not report this immediately**was it because

you expected to have pain after a heart attack	☐
the pain was less severe than before	☐
you did not want to bother the staff	☐
you thought it would get better	☐
other reason (please specify) _____	

_____

19. Did staff ask you whether you had any chest pain/discomfort

at regular intervals	☐
very rarely	☐
too often	☐

20. When you had chest pain/discomfort when would you be **most likely** ask for pain killers

as soon as the pain started	☐
when the pain became severe	☐
not ask, wait until it is offered	☐
put up with pain rather than have drugs	☐
If other situation please specify _____	

_____

21. When you asked for pain relief**would you expect**it to be given

immediately unless a nurse was interrupted by an emergency	☐
when the nurse isn't busy	☐
next time they are giving out the drugs	☐
never asked	☐
I would leave it to the nurses' discretion	☐

Appendix VIII

Dear Sir/Madam,

You have recently been a patient in the Coronary Care Unit (ward 21). Since pain is one of the commonest symptoms associated with heart attack the nursing staff within the Coronary Care Unit are interested in improving our methods of pain control. We would therefore like to ask you some questions related to your stay there . This information may help us improve care in the future. Please tick the boxes for the answer which most closely describes your experience.

This information is confidential so please feel free to give an honest opinion.

Here are some questions about your pain before you came to coronary care.

PLEASE TICK

PRE ADMISSION

1. Prior to your admission did you ever suffer from angina ?

yes ☐
no ☐
don't know ☐

2. **Before you came into coronary care,** how long did your chest pain/discomfort last before you contacted a Dr?

less than 1 hour ☐
more than 1 hour but less than 2 hours ☐
more than 2 hours but less than 4 hours ☐
more than 4 hours but less than 6 hours ☐
more than 6 hours ☐
I was not admitted with chest pain ☐

3. Was the pain

coming and going ☐
constant ☐

4. **Can you score the pain you had at that time** on a scale of 0-10, where 0 = no pain and 10 = worst possible pain (please circle the appropriate number)

0 1 2 3 4 5 6 7 8 9 10

no pain

worst possible pain

5. **Before you arrived at coronary care** which of these were you given for your chest pain/discomfort?

spray ☐
Tablets ☐
Injection ☐
nothing ☐
can't remember ☐

6. Did it help your pain/discomfort

not at all ☐
slightly ☐
quite alot ☐
pain cleared completely ☐

ADMISSION TO HOSPITAL

Here are some questions about your admission to hospital.

7. When you **arrived** at hospital how severe was your pain ?

Was it the worst possible pain ☐
very bad pain ☐
moderate pain ☐
no pain at all ☐
can't remember ☐

8. Can you score the pain you had on **admission** on a scale of 0-10, where 0 = no pain and 10 = worst possible pain (please circle the appropriate number)

0 1 2 3 4 5 6 7 8 9 10

no pain

worst possible pain

Here are some questions about your stay in Coronary Care (ward 21)

9. During your time in Coronary Care was the **cause of your pain** explained to you ?

by the nurse ☐
by the doctor ☐
by both ☐
by someone else (please specify)_____
no one explained this ☐
can't remember ☐

10. What were you told ?

11. Were you told it was **important to report** any pain/discomfort immediately ?

yes ☐
no ☐
don't know ☐

12. **How much** pain/discomfort did you have in Coronary Care ?

none ☐
a little ☐
alot ☐
can't remember ☐

13. If you had pain in coronary care was it

constant ☐
coming and going ☐
no pain ☐

14. **While you were in Coronary care, overall** how severe was your pain/discomfort?

Please score your pain/discomfort overall on a scale of 0 - 10, where 0= no pain and 10 = worst possible pain (Please circle appropriate number)

0 1 2 3 4 5 6 7 8 9 10
no pain worst possible pain

15. Please score how easy or difficult it was to describe your chest pain/discomfort, where

1 = very easy and 5 = very difficult to describe (please circle the appropriate number)

1 2 3 4 5
very easy to describe very difficult to describe

16. How would you describe your chest pain/discomfort?

17. When you had chest pain/ discomfort **how soon** did you report it to the staff

immediately	☐
within 30 minutes	☐
after 30 minutes or more	☐
Did not mention it	☐

18. If you **did not report this immediately** was it because

you expected to have pain after a heart attack	☐
the pain was less severe than before	☐
you did not want to bother the staff	☐
you thought it would get better	☐

other reason (please specify) _____

_____

19. Did staff ask you whether you had any chest pain/discomfort

at regular intervals	☐
very rarely	☐
too often	☐

20. When you had pain/discomfort when would you be most likely to use the pump

as soon as the pain started	☐
when the pain became severe	☐
put up with pain rather than use the pump	☐

If other situation please specify _____

_____

21. When you had chest pain/discomfort, **did you use the pump**

immediately	☐
after a short delay (within 10 minutes)	☐
after a long delay (more than 10 minutes)	☐

22. When you used the pump did you **expect this to give you**

- no relief ☐
- little relief ☐
- moderate relief ☐
- alot of relief ☐
- complete relief ☐

23. Did the pain killers in the pump **actually give you**

- no relief ☐
- little relief ☐
- some relief ☐
- a lot of relief ☐
- complete relief ☐

24. **Each time you gave yourself pain killers did the nurses ask** whether they had worked?

- always ☐
- more than half the time ☐
- less than half the time ☐
- never ☐

25. When you gave yourself pain killers how long was it usually before the pain went away (even if it came back later)?

- It never went away completely ☐
- less than 10 minutes ☐
- more than 10 but less than 20 minutes ☐
- more than 20 but less than 30 minutes ☐
- more than 30 but less than an hour ☐
- more than 1 but less than 2 hours ☐
- more than 2 but less than 4 hours ☐
- more than 4 hours (please specify how long)_____

26. How often did you usually have to use the pump before the pain went away?

_____

27. When did you **last experience** chest pain/ discomfort in the Coronary Care Unit?

_____

_____

28. Do you think you used the pump often enough?

yes ☐
no ☐

29. Was the pain control after your heart attack

inadequate ☐
adequate ☐
good ☐

30 Were you satisfied with your pain relief after your heart attack ?

yes ☐
no ☐

31. Can you score how adequate your pain relief was, where 0 = totally inadequate and

10 = totally adequate.(please circle the appropriate number)

0	1	2	3	4	5	6	7	8	9	10
totally inadequate										totally adequate

32. **On the whole** do you think the staff assessed your pain well?

always ☐
usually ☐
occasionally ☐
never ☐

33. Did you feel the staff were concerned about your chest pain/discomfort?

always ☐
usually ☐
occasionally ☐
never ☐

34. Do you think you were given **adequate instruction about how** to use the pump?

yes ☐
no ☐

35. Do you think you were given **adequate instruction about when** to use the pump?

yes ☐
no ☐

36. Did you ever **have any hesitation** about using the PCA pump?

_____
_____

37. Was there **anything you liked** about using this method of drug administration?

_____
_____

38. Was there **anything you disliked** about using the PCA pump?

_____
_____

39. If you were in hospital again in the future would you

a) prefer to use this pump for pain control ☐
b) prefer the nurses to give you pain killers ☐
c) have no preference ☐

40. Is there anything else about your experience of pain and/or your pain control in Coronary Care you would like to say?

THANK YOU FOR YOUR CO-OPERATION
GET WELL SOON!

Please return to: Karen Smith
Senior Charge Nurse
Ward 21
Ninewells Hospital
Dundee.

Appendix IX

Information Sheet for Patients.

Aim of the Study.

The experience of pain is the commonest symptom associated with heart attacks and angina At present we are trying to improve our methods of pain control within Coronary Care. To do this we need to know what the nursing staff ask you when you have chest pain.

Karen Smith a Senior Charge Nurse in Coronary Care is carrying out a research study in Coronary Care looking at the conversation which takes place between patients and nurses when patients have chest pain. To gather this information the nurses are asked to record on a tape recorder what is being said when patients report pain.

I would like to ask for your help in gathering information.

It is very important that you act as naturally as possible.

Method

A small tape recorder will be located in each room. On entering the room the nurse will;

1) Switch on the tape recorder.

2) Record what is said when you report pain.

3) Switch off the tape recorder before leaving the room.

Confidentiality.

Your confidentiality as a patient will be maintained at all times. The tapes will only be heard by Karen the Senior Charge Nurse. Names and/or initials will not be used in any presentation or publication which may arise from this study.

Consent and Withdrawls.

You may refuse consent to participate or withdraw from this study at any time without prejudice and are not obliged to state your reasons.

Thank you for your cooperation.

Patients Signature_____ Nurses Signature____ _____

APPENDIX X

INTERACTION DATA

Patient One

Total Nurse Spoken Time (secs)	Total patient Spoken Time (secs)	Total Time Nurse & Patient (secs)	Percentage of Time by Nurse	Number of Speech Segments (Nurse)	Number of Speech Segments (Patient)	Nurse
6.34	1.67	8.01	79.15	2	1	1
5.12	2.83	7.95	64.40	2	1	1
45.27	8.91	54.18	83.55	3	3	2
24.71	6.33	31.04	79.61	5	3	2
38.85	1.29	40.14	96.79	2	1	2
124.74	26.82	151.56	82.30	5	5	2
21.16	1.64	22.80	92.81	3	1	2
89.47	17.15	106.62	83.91	3	3	2
69.89	4.90	74.79	93.45	6	4	2
86.24	27.93	114.17	75.54	6	5	2
54.48	17.24	71.72	75.96	6	6	2
0.00	30.61	30.61	0.00	3	3	2
111.88	7.19	119.07	93.96	5	3	3
3.14	1.03	4.17	75.30	1	2	3
21.84	7.78	29.62	73.73	4	3	3
22.71	4.50	27.21	83.46	3	4	4
22.75	2.11	24.86	91.51	2	2	5
31.86	11.26	43.12	73.89	5	5	5
34.60	0.00	34.60	100.00	1	0	5

INTERACTION DATA

Patient Two

Total Nurse Spoken Time (secs)	Total Patient Spoken Time (secs)	Total Time Nurse & Patient (secs)	Percentage of Time by Nurse	Number of Speech Segments (Nurse)	Number of Speech Segments (Patient)	Nurse
21.77	18.16	39.93	54.52	4	4	2
28.82	15.99	44.81	64.32	4	3	2
14.17	13.73	27.9	50.79	2	1	2
20.45	19.31	39.76	51.43	4	4	2
35.56	24.59	60.15	59.12	5	4	2
54.4	15.02	69.42	78.36	5	4	2
46.27	64.72	110.99	41.69	5	4	2
32.07	28.68	60.75	52.79	4	4	2
34.96	5.5	40.46	86.41	2	2	2
27.18	25.9	53.08	51.21	3	3	2
5.12	7.72	12.84	39.88	1	1	2
4.92	8.18	13.1	37.56	3	3	2
21.77	28.46	50.23	43.34	6	5	2
5.65	3.59	9.24	61.15	2	1	2
162.14	156.18	318.32	50.94	25	23	2
45.83	35.04	80.87	56.67	13	12	2
160.52	50.54	211.06	76.05	17	18	2
103.71	69.06	172.77	60.03	21	12	2
29.01	15.57	44.58	65.07	8	2	2
60.93	47.12	108.05	56.39	9	8	2
0	24.9	24.9	0.00	0	1	3
213.42	45.7	259.12	82.36	14	12	4
34.55	0.94	35.49	97.35	2	1	4
54.12	41.04	95.16	56.87	5	4	4
136.82	5.25	142.07	96.30	2	1	4
494.55	86.82	581.37	85.07	9	8	4
74.61	39.07	113.68	65.63	9	8	4
53.12	49.86	102.98	51.58	6	5	4
25.99	26	51.99	49.99	4	0	5
6.1	0	6.1	100.00	1	0	6
96.97	42.1	139.07	69.73	9	7	6
18.23	8.68	26.91	67.74	3	3	6
36.85	10.91	47.76	77.16	4	3	6
60.56	23.09	83.65	72.40	3	2	6
30.48	35.54	66.02	46.17	3	3	6
2.48	0.94	3.42	72.51	1	1	6
49.48	24.75	74.23	66.66	4	5	6
16.27	11.91	28.18	57.74	3	2	6
125.64	69.96	195.6	64.23	7	7	6
93.65	33.61	127.26	73.59	11	9	6
15.52	41.22	56.74	27.35	6	6	6
15.88	15.04	30.92	51.36	5	4	6

Patient Three

Total Nurse Spoken Time (secs)	Total Patient Spoken Time (secs)	Total Time Nurse & Patient (secs)	Percentage of Time by Nurse	Number of Speech Segments (Nurse)	Number of Speech Segments (Patient)	Nurse
38.1	65.47	103.57	36.79	8	8	2
4.48	1.54	6.02	74.42	2	1	2
14.86	45.4	60.26	24.66	6	6	4
6.61	32.36	38.97	16.96	4	4	4
18.96	10.29	29.25	64.82	5	4	5
54.88	9.72	64.6	84.95	5	4	6
0	11.84	11.84	0.00	0	1	6
3.02	7.24	10.26	29.43	2	2	6
15.33	11.99	27.32	56.11	5	4	7

Appendix XI

PAIN ASSESSMENT SURVEY

This questionaire is totally confidential. Please complete as honestly as possible.

Definition

1.What is your definition of pain?

_____

Location

2. In assessing your patients pain do you ask the patient to point out or trace the area of pain?

Please tick; yes ___ no ___ sometimes ___

Quality

3. Do you have the patient describe the pain in his own words whenever possible?

Please tick; yes ___ no ___ sometimes ___

Intensity

4. Do you ask the patient to rate the pain?
Please tick; yes ___ no ___ sometimes ___

5. By using a scale of 0 - 10 (10 being the worst)?

Please tick; yes ___ no ___ sometimes ___

6. By degree (hurts a little to really hurts)?

Please tick; yes ___ no ___ sometimes ___

7. In relation to something (How is it today compared to yesterday?)

Please tick; yes ___ no ___ sometimes ___

Onset

8. Do you ask the patient when his pain began or started?

Please tick; yes ___ no ___ sometimes ___

Duration

9. Do you ask the patient how long he has had the pain or how long the pain has lasted ?

Please tick; yes ___ no ___ sometimes ___

Variations

10. Do you ask the frequency of the pain (or the number of times it occurs) ?
Please tick; yes ___ no ___ sometimes ___

11. Do you routinely ask the time of day the pain occurs ?
Please tick; yes ___ no ___ sometimes ___

Patients perception of pain

12. What causes or brings on the pain? Do you routinely ask this question? It may be in relation to emotions, activity,etc.

Please tick; yes ___ no ___ sometimes ___

13. Do you ask what makes the pain better (relieves or controls it) ?

Please tick; yes ___ no ___ sometimes ___

14. Do you ask what makes the pain worse (aggravates or increases it) ?

Please tick; yes ___ no ___ sometimes ___

15. Do you assess symptoms associated with the pain (such as nausea, sweating etc) ?

Please tick; yes ___ no ___ sometimes ___

16. Do you ask the patient how he expresses his pain?

Please tick; yes ___ no ___ sometimes ___

Miscellaneous

17. If you do assess most of these parameters in your patient with pain, do you record or document this information (charts or nursing kardex) ?

Please tick; yes ___ no ___ sometimes ___

18. Who is responsible for relieving the pain?

Please Tick; Dr ___ Nurse ___ Patient ___ All ___ None ___

Other ___

19 Please list any factors you think may hamper your assessment of the patient (may be related to culture, appearance of the patient, age of patient, diagnosis, socioeconomic status etc) ?

_____

_____

Demographic Data

1 Your age ? 20-29 ___ 30-39 ___ 40-49 ___ 50-59 ___

2. Your nursing education ? RGN ___ RMN ___ EN ___ BSc____ Diploma ___

OTHER (please specify) _____

3. Years in Nursing ? (Post registration)

0-5 ___ 6-10 ___ 10 or more ___

4. Are you employed? Full Time ___ Part Time ____

Appendix XII

Pain Management Programme

09.00-09.15 hours	Introduction which included the aims for the day and the progress of the research study.
09.15-10.00 hours	Review on the current status and principles of pain management and the research findings over the past 20 years.
10.00-11.00 hours	Group exercises were completed. The staff were split into two groups who were given a selection of activities to complete. The groups then reconvened and feedback was obtained. The issues which were brought up were discussed.
11.00 -11.30 hours	The physiology of pain with particular reference to cardiac ischaemia. (This lecture was supplemented by the handout produced for all staff).
1130-11.50 hours	Identify this Pain! Scenarios of signs and symptoms of patients were played on audio tapes (Model 1989) and staff were asked to identify the cause and suggest treatment strategies.
11.50-12.30	The experience of pain; Factors which inhibit pain assessment. The group were asked to participate in role play sessions in pairs. Having completed this exercise the factors which may hamper pain assessment were discussed and a potential chart for pain assessment introduced.
12.30-13.30	Lunch
13.30-14.15	"Anything for pain?" The video on the management of acute pain was viewed. This reflected many of the problems which impair pain management and their implications were discussed.
14.15-15.00	Pharmacological Management of Pain. This lecture reviewed the different groups of analgesic agents available, their pharmacological actions, and side effects considered the principles of the analgesic ladder (WHO 1986) and the issues of adequate prescription and administration.

15.00- 15.45	Non pharmacological interventions in pain management. This explored additional approaches which could be used in pain management. The staff were once again encouraged to actively participate by performing relaxation exercises.
15.45-16.00	Wind Down! The main points covered were summarised. The introduction of the pain assessment chart was readdressed. Staff were asked prior to leaving to consider what they had achieved in the day which could be utilised in their clinical practice.

Appendix XIII

The Nurses Role In Pain Management

Exercise

Think about any painful experience you have had.
How did it feel?
Did it remind you of any previous experience?
What did you do to relieve it?

Write down the words you would use to describe this pain.
Describe this pain to your partner and get them to write down the words they thought were important.
Compare these words.

Personal notes;

Physical care, reduction of anxiety, ,massage , relaxation and distraction are measures employed by nurses in everyday practice .. During the last six months can you remember any specific instances when you have used these techniques whilst assisting patients with pain relief? Please make notes about the particular technique used, the circumstances in which it was used and its effect on the patients pain.

Notes;

Discuss these intervention with the group members.

Appendix XIV

Pain

Pain is a combined emotional and physical experience. It is a protective response which arouses an individual and provokes a challenge from the bodies defence system. When assessing and managing a patient in pain it should be remembered that pain can be described as either acute or chronic. Acute pain can occur as an episode having a beginning and an end. Chronic pain on the other hand is an ongoing experience. Pain associated with myocardial infarction falls into the former category, the significance of which determines how pain relief should be managed.

Group Exercises

Discussion is an opportunity for everyone in the group to share knowledge from which we can all learn.

Consider a patient whom you have nursed recently. To the best of your knowledge answer the following questions.

1) What was the patients diagnosis?

2) Where was his/her pain located?

3) From the knowledge you had about the pain what was the source of the pain?

4) Again from your knowledge of the patient what factors influenced the pain?

5) How was the pain assessed and monitored?

6) What drugs were used to control the pain?

7) What if any other treatment was given for the pain?

Personal Notes;

Appendix XV

Group Exercise

1) Identify and discuss the factors which influence a patient's pain in either a positive or a negative manner?

2) Identify and discuss the factors which influence the way in which nurses perceive pain in their patients.

3) Draw up a frame work for
a) the initial assessment of pain and
b) the ongoing assessment of pain in a patient with ischaemic heart disease

4) Identify and discuss the nursing interventions you would introduce to alleviate pain.

5) Complementary measures; when to and when not to introduce them in the care of cardiac patients.

Appendix XVI

Categorisation of information related to pain from transcribed tape recordings

Information related to....	Identified by both raters	Identified by rater 1 but not 2	Identified by rater 2 but not 1
Onset	8	1	1
Duration	14	0	2
Location	33	3	2
Quality	32	4	8
Intensity	34	0	6
Rating Scale	11	0	0
Radiation	7	1	1
Aggravating Factors	15	1	4
Relieving Factors	15	1	10
Associated Symptoms	14	3	4
Treatment	25	4	3
Importance of relief	3	0	0
ECG	13	0	0
Presence of pain	43	22	4
Total (% of all ratings)	**267/352 = 76%**	**40/352 = 11%**	**45/352 = 13%**

It can be seen from the above data the level of agreement amongst both raters was high (76%) which suggests the method of categorisation of the data was reliable and could be replicated.

Appendix XVII

INVITATION TO ENTER THE STUDY

Hello Mrs.....

My name is . I am one of the staff in the Coronary care Unit.

Do you understand why you have been admitted here?

You have had a heart attack which has caused this pain in your chest.

We are doing a study (in CCU) to try to improve pain control and to find out the best way to ease pain after a heart attack. The pain-killer we normally use is diamorphine.

If you agree to take part in the study you will be allocated to one of 2 groups; the pain killer will either be given to you by an injection from the nurse through this tube in your arm; or you will be attached to a drip and can give yourself the pain killer by pressing a button.

Whatever method is used you will have as much pain-killer as you need to control your pain.

We will be following your progress throughout your stay in hospital. You are under no obligation to take part in this study and if you decide to take part you have the right to change your mind and come out of this study.

Do you have any questions about what I have just said?

Would you be willing to take part in the study?

Appendix XVIII

Ethical Committee Approval (1990)

82/9

TAYSIDE HEALTH BOARD

DUNDEE GENERAL HOSPITALS

[redacted]

[redacted]

Ninewells Hospital

DUNDEE DD1 9SY

2nd October, 1990

Staff Nurse Karen Smith,
Coronary Care Unit,
NINEWELLS HOSPITAL.

Dear Staff Nurse Smith,

Committee on Medical Ethics
Approval of Research Proposal

I write to advise you that the Committee on Medical Ethics has given its approval to the undernoted proposal as detailed in the protocol submitted by you:

"Patient Controlled Analgesia for Chest Pain associated with Myocardial Infarction".

Ref. 82/90

Yours sincerely,

SECRETARY
Committee on Medical Ethics

c.c. Mr. N. F. Brown

Appendix XIX

Ethical Committee Approval (1992)

TAYSIDE COMMITTEE ON MEDICAL ETHICS

[redacted]

[redacted]
Ninewells Hospital
and Medical School
DUNDEE. DD1 9SY

4th August, 1992

[redacted]
Ninewells Hospital.

Dear Mrs. Smith,

Patient Controlled Analgesia for Chest Pain Association with Myocardial Infarction

Further to your letters of 2nd August, 1992 I am pleased to confirm the agreement of the Ethics Committee to the amendments to this protocol subject to the points made by Mr. MacConnachie at the end of his letter being acted upon if appropriate.

Yours sincerely,

[redacted]

Secretary

Appendix XX

PATIENT CONTROLLED ANALGESIA

FOR CHEST PAIN

ASSOCIATED WITH MYOCARDIAL INFARCTION

Contact Karen Smith: [redacted]
Telepager No

AIM OF STUDY

To compare the analgesic efficacy of diamorphine administered via a PCA system to the conventional method of intravenous bolus administration by the nursing staff for patients with myocardial infarction.

SELECTION CRITERIA:

All patients admitted to CCU during the specified study period with a diagnosis of Myocardial infarction (Defined by ECG Changes of the ST segment, elevation > 0.1Mv in 2 Standard leads or > 0.2 Mv in precordial leads and/or elevated CK levels) will be recruited into the study when they have pain requiring opiate administration.

Patients will then be assigned to either Group 1 = Control
Group 2 = PCA

EXCLUSION CRITERIA

The following patients will be excluded from the trial:

Those aged < 30 or > 80
Pateints with severe renal or hepatic failure
Cardiogenic shock
Severe heart failure
Inability to comply with the study procedure
History of drug abuse
Known opiate sensitivity

INITIAL SCREENING

All patients satisfying the entery criteria will be randomly assigned using the random numbers table to either the PCA GROUP or CONTROL GROUP and allocated a study number.

Demographic data will be collected.

Analgesia and or other drug therapy taken and/or given prior to admission will be recorded.

PCA GROUP

Immediately on entry to the study (i.e. if the patient experiences pain requiring opiate administration) the patient will be given an intravenous injection of Diamorphine titrated to individual requirements until a pain free state is reached. The patient will then be connected to the PCA device and the pump will be programmed to deliver a preset bolus dose of diamorphine (initially 1mg) with a lockout interval of 3 minutes.

CONTROL GROUP

Patients within the control group will receive the conventional method of analgesia ie. intravenous bolus injection of diamorphine as required. This injection will be administered by the nursing staff as per unit policy.

OUTCOME MEASURES

PAIN SCORES

The patients' pain levels will be assessed using a standard Numerical Rating Scale, hourly and before and after analgesia is administered for every episode of reported pain.

Patients who are asleep will not be wakened.

Should pain persist consider how much analgesia has been taken
when the last dose was
Is the pump working effectively
Repeat ECG
Inform medical staff and Karen
Does bolus dose need increased?
Are Nitrates Necessary ?
(please try to encourage adequate analgesia before commencing nitrates)

Please do not send pain charts up to the wards for the duration of the study. Put them in the study file.

ANALGESIC CONSUMPTION

Total analgesia required will be recorded after 24 and 48 hours.
Pumps should be read hourly and the amount of analgesia and the amount of tries noted.
Please check every 15 minutes for the first hour.

Additional analgesia will be noted eg. NSAID.

Outcome measures continued..

CATECHOLAMINE MEASUREMENTS

Urinary catecholamine levels will be measured in two 24 hour urine collections while in CCU and repeated on the 5th day of admission in the general medical ward.

Biochemistry forms will be available in the folder marked CATECHOLAMINES. Stickers with the patients details will have to be attached. Please put one on each copy. A bottle and form should be sent up to the medial ward to commence at a convenient time for the patient ie. when they wake up.

This sampling is non invasive and will not alter patient care.

QUESTIONNAIRES

Prior to discharge they will be asked to complete a questionnaire while on the medical wards in order to explore qualitatively their experience of pain.

WITHDRAWALS

The patient may at any time withdraw his/her consent to participate in the study without prejudice to their care. They are not obliged to state their reasons for withdrawl. Patients may also be withdrawn if;

1. The patient develops serious side effects.

2. The patient develops a concurrent condition.

ETHICAL CONSIDERATIONS

INFORMED CONSENT

Before patients are enrolled all pertinant aspects of the study will be explained to them and their consent obtained. Patients should recieve a copy of the patient information sheet. Because patients are acutely unwell and distressed it is not always possible for written informed consent to be obtained. For this reason where written consent is not possible then witnessed verbal consent will be acceptable.

ETHICAL APPROVAL

Ethical committee approval from Tayside Health Board Committee on Medical Ethics has been granted.

FINANCIAL CONSIDERATIONS

Graseby Medical Ltd. have agreed to the free loan of 7 Syringe Drivers for the purpose of this study. (approximately 3 months)

POTENTIAL PROBLEMS

As with any study there will undoubtedly be some problems encountered. It is essential for the smooth operation of this study that any queries no matter how trivial they appear are considered as soon as possible. For this reason I will have the use of a telepager from British Telecom. Please use it to contact me if I am not in the hospital or at home.

The number is _____

Home telephone number is [redacted]

Thank you all for your cooperation, without your help this would be an impossible task.

Appendix XXI

[redacted]
Ninewells Hospital
Dundee
10/5/92

Dear Dr ,

I am writing to inform you about a research study which I am currently completing in Coronary Care. This study "Patient Controlled Analgesia for Chest Pain associated with Myocardial Infarction" is supported by a part time research fellowship from the Scottish Home and Health Department and has been given ethical approval by the Committee on Medical Ethics, Tayside Health Board.

As part of this study it is my intention to measure urinary catecholamine levels following the first 48 hours of admission and on the 5th day following the patient's Myocardial Infarction. Since the patients will no longer be in CCU at this time, I would like to complete a 24 hour urine collection while they are in your unit. The appropriate bottles and necessary request forms will be sent up with the patients therefore should not affect staff workload.

I have discussed this with the Senior Charge Nurses in the department and they are happy to offer their assistance.

Please do not hesitate to contact me regarding any queries you may have. I would be happy to come up and discuss this with the medical staff if you feel this is appropriate.

Yours sincerely

Karen Smith
Senior Charge Nurse

Appendix XXII

PATIENT INFORMATION SHEET

You have recently suffered a heart attack and you may have experienced severe chest pain. At present we are trying to improve our methods of pain control within coronary care. The nursing staff are involved in a study to compare the effects of two different methods of drug administration. The standard method of drug administration is for the nurse to give an intravenous injection of diamorphine via the cannula which is inserted in your arm. This will be compared to a method in which you can administer your own drugs via a syringe pump.

Before deciding whether or not to agree to participate in this study you should read or have read to you this information sheet and consider it carefully. Any questions you have will be answered by the nursing staff.

PURPOSE OF THIS STUDY.

The purpose of this study is to compare the effectiveness and safety of two methods of administering a drug to control your pain. The drug used will be diamorphine which is the standard drug used for pain after heart attacks and when you have pain it will either be given to you by an injection from the nurse or you will be attached to a "drip" and by pressing a button you can administer a small dose of the drug whenever you need it. The pump has been tested in other areas and has been found to be very safe and effective.

When people are in pain they often excrete substances in their urine called Catecholamines. We would like to measure the amount of these in your urine.

This will be done by collecting your urine for 48 hours after your admission to CCU. A further 24 hour urine collection will be done on day 5 when you are in the medical ward to compare levels following your discharge fron CCU.

After your transfer from CCU you will be asked to complete a questionairre.

CONSENT AND WITHDRAWL

You may refuse consent to participate or withdraw from this study at any time without prejudice and are not obliged to state your reasons.

CONFIDENTIALITY

Your confidentiality as a patient will be maintained at all times. Patient's names and or initials will not be used in any publications which may arise from this study.

Thank you for your cooperation.

Patients Signature _____ Nurses Signature _____ Date _____

Appendix XXIII

PCA PRESCRIPTION SHEET

Patients Name: Date of Birth

Study Number

PROGRAMME SETTINGS

Loading Dose = 0 mg

Bolus Dose = 1 mg

Lockout Interval = 3 minutes

Dose Duration = Stat

Concentration = 1 mg/ml

Background Infusion = 0 mg/hour

Prescribed By; _____ Date _____

Prepared By; _____ Date _____

_____

	Date	Time	Amount Discarded	Signature
Start				
Refill				
Refill				
Refill				

Total Volume Infused = mls

total Dose infused = mg Diamorphine 24 hours
mg Diamorphine 48 hours
mg Diamorphine when pump disconnected

Last dose given hours

Appendix XXIV

DEMOGRAPHIC DATA

NAME; AGE:

SEX: MALE____ FEMALE___

WEIGHT_____

PREVIOUS HISTORY OF ISCHAEMIC HEART DISEASE YES___
NO___

PREVIOUS MYOCARDIAL INFARCTION YES___
NO___

If yes when;_____

Was analgesia given before arrival at hospital yes___

No___

If yes by whom : self___GP ___ MCCU ___
Other_____

What was given :		yes	no
GTN		___	___
	Nifedipine	___	___
	Cyclimorphine	___	___
	Diamorphine	___	___
	paracetamol	___	___
	coproxamol	_____	___
	naproxen	___	___

DIAGNOSIS : MYOCARDIAL INFARCTION ANTERIOR _____
INFERIOR _____
POSTERIOR_____
LATERAL _____
INFLAT _____
ANTLAT _____
OTHER _____

If not MI , diagnosis _____

CK RESULTS ____ ____ ____

REPERFUSION YES ☐ NO ☐

Appendix XXV

Baseline characteristics of study groups

	PCA	Control	Statistical Test
Mean Age (SD)	61.37 (9.17)	60.03 (9.70)	ANOVA F1,58 = 0.30; P> 0.05 N.S.
Sex Ratio Male/Female	21/9	20/10	χ^2 (1) = 0.077; P > 0.05 N.S.
Previous IHD	15	10	χ^2 (1) = 0.558 ; P > 0.05 N.S.
Previous MI	8	5	χ^2 (1) = 1.180 ; P > 0.05 N.S.
Site of MI			χ^2 (1) = 0.719; P > 0.05 N.S.
Anterior	10	10	
Inferior	10	14	χ^2 (1) = 0.719; P > 0.05 N.S.
Other	9	6	
Reperfusion	12	9	χ^2 (2) = 0.4237; P > 0.05 N.S.
Smoking Status			χ2 (1) = 2.94; P > 0.05 N.S.
Current	19	13	
Non Smoker	9	6	
Ex Smoker	2	7	
Opiates received pre-admission	15	22	

Appendix XXVI

Patient responses to Question 10 - What were you told (about the cause of your pain)

1) The Heart
4) Can't remember
6) Due to a reducing supply of blood/oxygen to the heart caused by the arteries furring up
7) A heart attack
12) I was shown a video
15) No response
16) That I had a heart attack
18) That I had a heart attack
21) I had suffered a heart attack
22) Something about a blood clot and the blood not reaching the heart
23) That an artery was blocked and there was not enough oxygen getting to the heart and the heart had to work a bit harder than normal
28) No response
29) Can't remember
35) A possible explanation
38) No response
40) I'd had a heart attack
41) Small heart attack caused by a clot
43) A blockage in the artery
47) Clot blocking artery to the heart
49) Possible heart attack
51) Explained it was a clot in the blood vessels
53) That I was having a heart attack
54) Artery supplying blood to the heart blocked by a clot
56) Blood clotting
58) I had a heart attack

PCA

3) It had been a clot of the blood
9) I had had a heart attack caused by a blood clot in the heart cutting off the supply of oxygen to the heart
10) No response
11) I had suffered a heart attack caused by a clot blocking an artery. The clot would be dissolved by the drip in my arm
13) no response
17) That I'd had a heart attack but would be OK. That I had a painkiller drip which I could use myself by pressing the button affixed to my right hand
19) Heart attack caused by blood clot
20) Parts of the heart had failed and were bruised due to lack of blood
24) Damage had been done to the heart and what drugs and treatment was necessary to put this right,also the steady way will carry on after leaving hospital.
25) No response
26) Can't remember

30) No response
32) At first I was thought it was angina or an ulcer but blood test said heart and told how the heart works
33) Stop smoking! There is not a big or a small heart attack everything that is being said applies at all times, very definite advice and fully appreciated.
36) You are having a heart attack
37) *
39) Inflammation around the heart which would take a few days to go away
42) That I'd had a heart attack
45) Blood clot which would be dissolved by drugs
46) I suffered a heart attack
50) I was taking a heart attack
52) That I was having a heart attack, cant remember clearly.
57) A blood clot
60) Cant remember

Patient responses to Question 16
How would you describe your chest pain discomfort?

Control Group

1. Nil
4. Chest breaking up into lots of pieces, shooting sharp and hurt very much
6. Quite severe but could stand more. Have had more severe pain with a broken wrist
7. More discomfort than a pain. Like breathing in very cold air and having it lying on the chest. I was sweating profusely but felt cold and shivering and very panicky. I had also been feeling sick.
12. The pain went from the front of my chest right through to my back
15. Tightness,crushing, two steel hooks pulling my chest apart. Pain down the back of my neck, left arm and back of hands looked swollen and discoloured.
16. Like someone stabbing me with a sharp instrument
18. Burning pain in the chest
21. Awareness of angina pain- heavy
22. The pain was very sore it would start in the middle of my chest then spread but the worst thing was the shortness of breath
23. Very severe starting in the chest also in both arms and going through to the back
28. None at all
29. Very hard to describe as it was not a piercing pain. Bad ache in chest and inside arms
35. Like a knife stuck in my chest
38. Tightness in the chest
40. Very very sore pain travelling from chest up to throat and jaw
41. Lots of pain high on chest
43. Excruciating , great pressure not able to get a breath
47. Sharp, pulsating, if someone had stretched my back it would have helped
48 "just a complete soreness like a lump of lead sticking in my chest/ gullet"
49. At first I would have done anything to ease the pain
51. It was in my neck
53. Increasing pain followed by a sudden drop in pain but pain never completely disappearing
54. Tightness/numbness in chest and upper arms
56. Wind
58. A weakening pain drained me of energy

PCA

3. It was like a vice closing on my chest
9. Tingling in arm, tightness in the chest
10. Tightening in the chest, pain in my lungs
11. I don't think it's possible to describe the pain
13. Like a severe attack of indigestion but very tight and heavy
17. Gradual caving in of the chest with strange painful sensation down left arm
19. Ache across the chest and slight tingle down the arms
20. As if the left side of the chest and left arm were being squashed the lower jaw also went numb.

24. On arrival at Ninewells very painful, tightness and gripping feeling made it difficult to breathe

25. The chest pain was stunning pain but the arm pain was worse
26. Discomfort down the centre of the chest, burning sensation just like heartburn
30. It seemed as if the pressure on your chest was getting stronger by the second
32 The way I was told about a woman having a baby ? would not like a repeat
33. When I broke my collar bone and dislocated my shoulder an excruciating ache firstly in my left arm then in my chest and then my right arm
36 A tightening of the chest
37. Like indigestion pain
39. Tight burning pain in the centre of chest which went down the right arm spreading across the chest.
42. Very sore inwardly
45. Like pressure which is there all the time
46. Hard to breathe pain band round body and down right arm. Sore neck, teeth and ears.
50. Severe gripping pain
52. Excruciating
57 I thought it was very bad wind as knowing or thinking I was such a healthy person I didn't think for one minute it was anything to do with my heart.
60. Sharp pain in the centre of my chest

Patients opinions of Patient Controlled Analgesia

Did you ever have any hesitation in using the PCA pump?

Just at first worried you had taken too much
Initially

Needed to stress more that it was good to keep using it, since I tried to use as little as possible... Felt it would be better if I could manage without it- mistake!!

Would not have hesitated
I was in so much pain at the time I didn't take in what they said; it was releasing morphine into your veins, if I'd known this I would have used it more...repeated instructions would help as I'd forgotten I had the pump in my hand.

Not later on, did at first.

Anything you liked about using this method of drug administration?

It saves time and no discomfort with an injection.
It made you feel you were helping yourself instead of depending on others
Easier, didn't have to wait for medication to come to you, you could just press it and it eased your pain.
I didn't have to wait for staff to bring you pain killers
Yes, the knowledge that I had the technical ability to control the pain I found to be very comforting
The control.. the immediate response... the independence.
Yes, instant self reaction
When using this method pain returning slightly seemed to go very quickly
This method for using the drug administration is fantastic
It was very simple to use and you were in control of the use of it and therefore didn't have to bother the nurses.
It was like a good companion always in hand
I administered the drug on more than one occasion when the staff were extremely busy on presumably more important care than I was requiring at that time.
Painless
Didn't have to wait for relief
You did not get a needle every time and I was able to use it whenever the pain started
It was very easy to use no exertion, seemed to work well enough
Was able to administer the drug without bothering the nurses on duty
You didn't have to wait for it it was there instantly.
simple and direct
Yes the fact you were not always having to have a needle stuck in your arm every time you had a pain
After the pump you felt it going away and that was it.

Any thing you disliked about this method of drug administration?

Nothing it was easy to use and effective
Dear sir, I had lots of needles during the 1939-45 war but the person who thought up this pump deserves the VC

My reasons for using it which I may have been able to avoid (*I assume he means reasons for his MI).